MAY 1961

RUBBER WORLD

v144 #2

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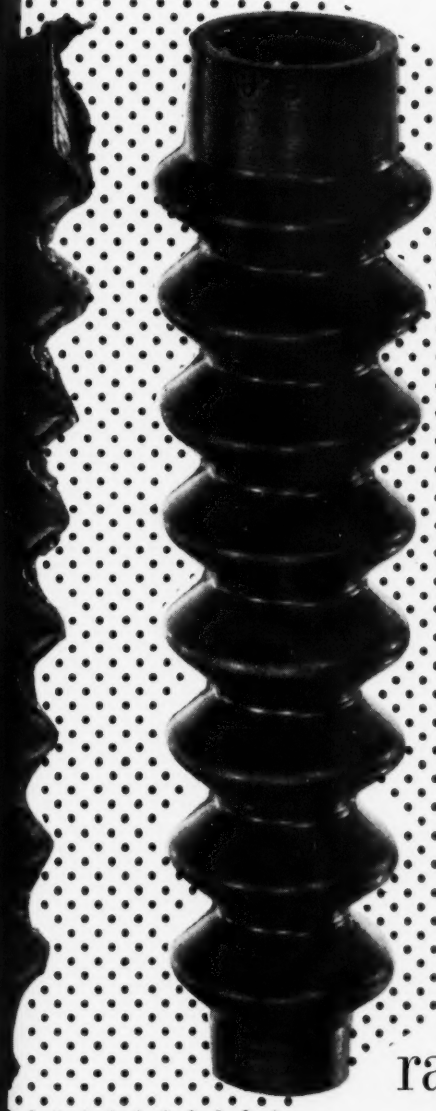
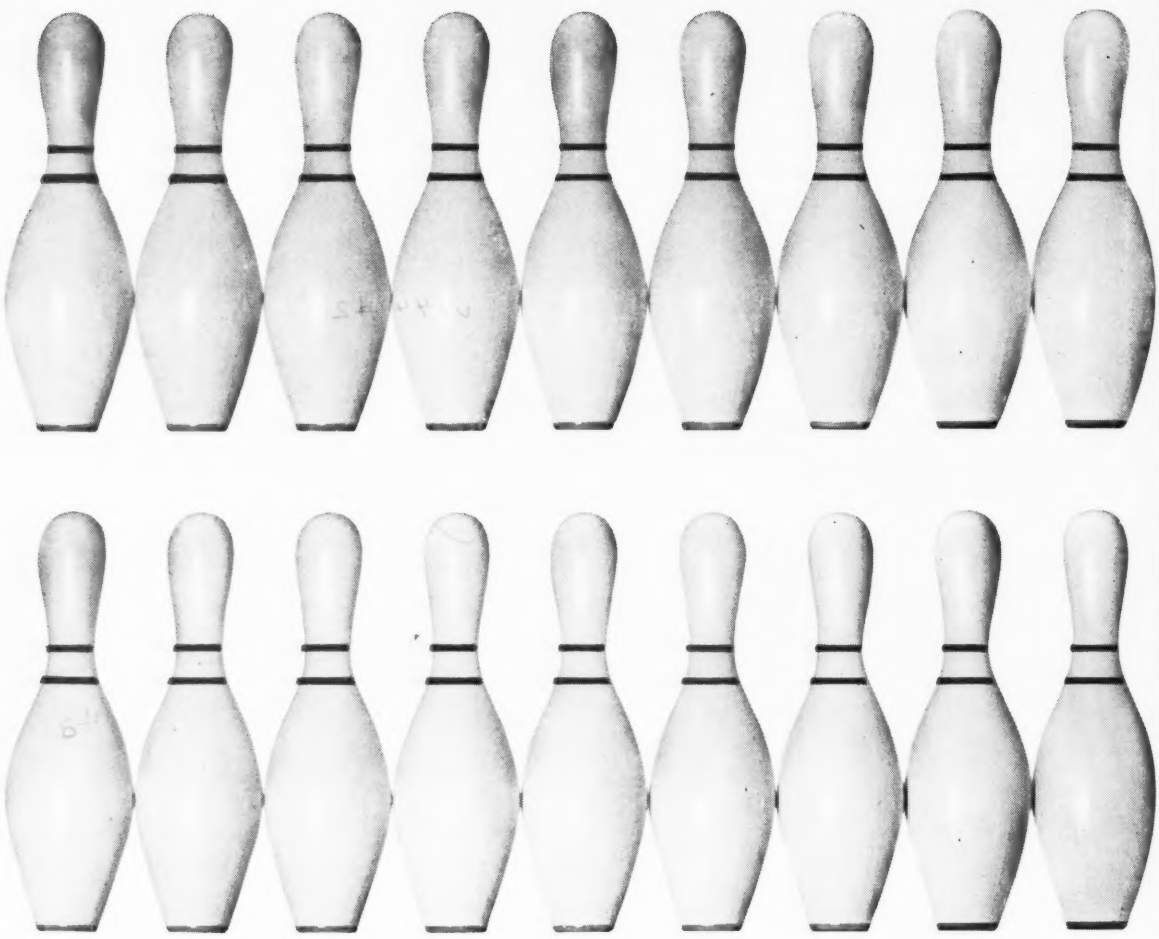
TECHNOLOGY DEPARTMENT Ha



rapid mechanical deflashing



Du Pont means *UNIFORMITY* in Rubber Chemicals

Du Pont rubber chemicals are made to exacting standards of quality and reliability to meet rigid inspection controls.

That's why you, like so many leading manufacturers, can depend on Du Pont rubber chemicals to meet your most rigorous requirements.

This is part of Du Pont's continuing effort to provide you with dependable rubber chemicals of the highest quality and uniformity.

Accelerators	Stabilizers	Special-purpose Chemicals
Antioxidants	Peptizing Agents	Rubber Dispersed Colors
Mold Lubricants	Blowing Agents	Reclaiming Chemicals

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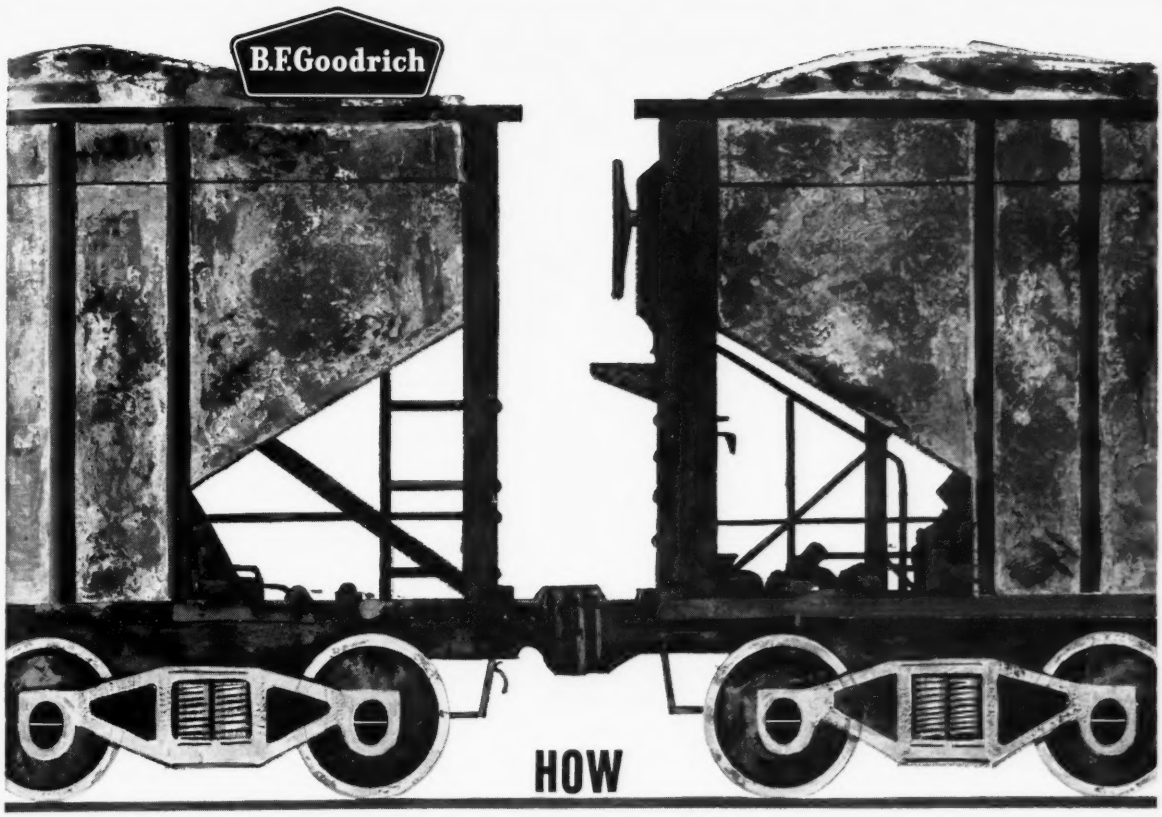
ELASTOMER CHEMICALS DEPARTMENT
RUBBER CHEMICALS

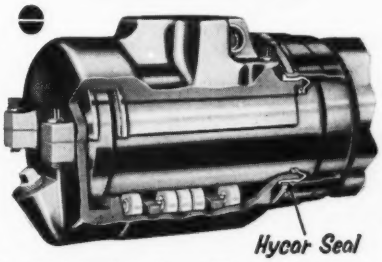
Better Things for Better Living . . . *through Chemistry*

RUBBER WORLD, May, 1961, Vol. 144, No. 2. Published monthly by BILL BROTHERS PUBLISHING CORP. Office of Publication, 3rd & Hunting Park Ave., Philadelphia 40, Pa., with Editorial and Executive Offices at 630 Third Avenue, New York 17, N. Y., U.S.A. Second Class Postage Paid at Philadelphia, Pa., under the act of March 3, 1879. Subscription United States $5.00 per year; Canada $6.00; all other countries $10.00. Single Co ies 50¢ in U.S.; $1.00 elsewhere. Address Mail to N. Y. Office. Copyright May, 1961, by BILL BROTHERS PUBLISHING CORP.



Clevite sealed sleeve cartridges using an oil seal of Hycar are manufactured by Cleveland Graphite Bronze division of Clevite Corporation, Cleveland, Ohio. B.F.Goodrich Chemical Company supplies the Hycar nitrile rubber for molding into seals.

HOW HYCAR PUTS A SEAL ON "HOT BOX" ELIMINATOR



Hycar Seal

Inspection of the working parts of this sealed sleeve bearing cartridge is necessary just once every nine years, according to the manufacturer. Beyond this, the only maintenance needed to assure against freight car "hot boxes" is an annual check of oil levels. Fitted against the journal inside the housing is a positive oil seal made of Hycar nitrile rubber which permanently retains the lubricant.

The manufacturer says, "Without question, there isn't a seal that compares with this one." He's referring to the outstanding resistance to abrasion, to oils and other hydrocarbons and to heat offered by Hycar. Years of service under these tough conditions won't affect the resilience or effectiveness of these seals. The properties of Hycar solve a tough molding problem, too.

Here's another example of how Hycar improves present products, sometimes makes possible entirely new products for new markets. Can Hycar help solve your problem? Write for information—Department MD-4, B.F.Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. In Canada: Kitchener, Ontario.

B.F.Goodrich Chemical Company

a division of The B.F.Goodrich Company

Hycar Reg. U.S. Pat. Off.

Rubber and Latex

RUBBER WORLD

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SERVING THE RUBBER INDUSTRY SINCE 1889

A BILL BROTHERS PUBLICATION

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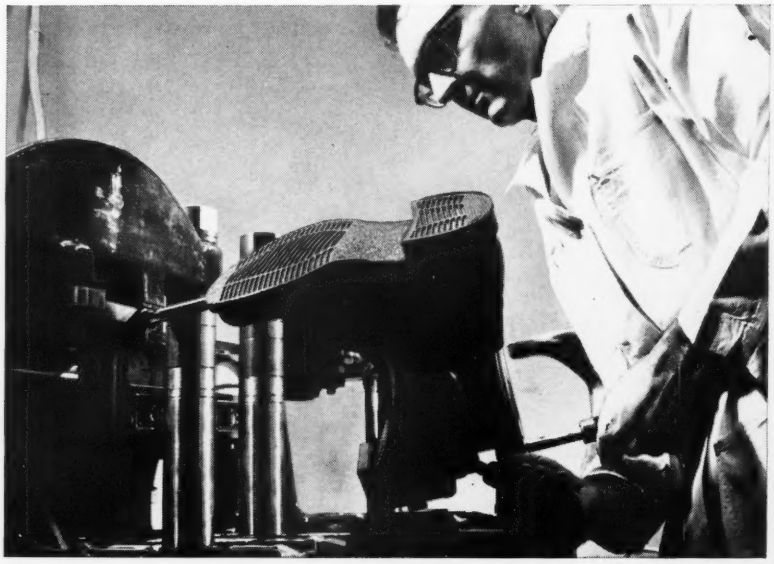
BPA NBP BPA

BULLETIN:

Shell Chemical tears brand-new shoes apart in the search for better footwear, flooring, tires and bottle nipples

Shell's Technical Service Laboratory is a department of self-criticism. Every new rubber that Shell develops must make the grade here before it can be sold.

Read about the men who run this laboratory—the unusual way they are helping the shoe industry find new polymers and manufacturing methods—and how they can help your company solve costly problems.



A Shell Chemist puts the finishing touches on a mold-on shoe sole. Next, he will tear it apart for analysis. This is one of many tests at Shell's Technical Service Laboratory that aid in the discovery of new and more economical rubber polymers.

THE MEN at Shell Chemical's Technical Service Laboratory are practically jacks-of-all-trades. Recently, they became cobblers.

To develop new rubber and processing techniques for the footwear industry, Shell installed three shoemaking machines. Each machine cures a rubber sole and molds it onto a shoe top.

Shell tears new shoes apart

The shoes made by Shell do not stay in one piece for long. They are deliberately torn apart for thorough testing.

Shell technicians then study the sole. Its color. How it adheres to its top. And the most economical way to make each shoe.

This analysis results in new and better polymers and production methods for shoe manufacturers. And better soles and heels for their customers.

This work with shoe polymers also pays off in other products. They range from heavy-duty tires to bottle nipples. Shell Chemical's SP-103 makes durable floor tile as well as shoe soles. And the easy processability of Shell's S-1509, useful in the mold-on sole process, is also an advantage in making automotive sponge. New applications are being found every day.

Shell's first customer

New Shell polymers and latices encounter rigid testing and analysis by these experts. That is why this laboratory is called "Shell's first customer."

But sometimes manufacturing problems arise even with fully accredited polymers. When this happens, Shell is ready to go to work at once.

Many special application problems are solved in the laboratory in a matter of hours—others take days. If a problem calls for on-the-spot assistance, Shell sends its men to work with the plant's own technical staff.

Moneysaving help

If Shell Chemical's Technical Service Laboratory can help you solve a costly problem, call your Shell representative. Or write Shell Chemical, Synthetic Rubber Division, P.O. Box 216, Torrance, California.

A Bulletin from

Shell Chemical Company

SHELL

Synthetic Rubber Division

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RLD

news of the rubber world

May, 1961

If negotiations still in progress follow along the lines of contracts already signed by the URW with several major rubber companies, there should be little labor strife in the industry this year. It would seem from the precedents set, wage rates included in original contract and wage differentials between tire and non-tire plants, that the negotiators went to the bargaining table with real cooperation in mind. (See page 100.)

Dr. Ray P. Dinsmore retired on May 2. A Goodyear researcher since 1914, he has had a major part in many developments which have helped our industry grow. He concluded his active career as Goodyear's vice president for research and development. We wish him good health and a pleasant rest. (See page 103.)

Growing maturity of the rubber industry is indicated by the number of anniversaries being celebrated. Two Golden Anniversaries that have come to our attention are Gates Rubber Co. and H. Muehlstein & Co., Inc. United Engineering & Foundry Co. is celebrating 60 years of service. To these three companies, and any others we may have missed, also go our best wishes.

More help toward efficiency and quality is promised by two newly announced developments. Wheelabrator's deflashing unit and ASRC's liquid SBR Flosbrene should prove very useful in certain applications. The deflashing machine (page 67) helps cut down on tedious hand-trimming; while Flosbrene (page 82) has had initial success in solving some hard rubber processing problems and shows promise in other areas.

A is for Accelerating your entire plant operation

For a fast start and a *good finish*, put your money on Philblack* A. Mixes fast and easily . . . speeds up processing . . . turns out products with a smooth, satiny finish . . . *leads the field all the way!* Use Philblack A for smooth, swift tubing; easy, accurate extrusions; excellent mold flow; superior calendering. Easier plant operation, too.

There are four Philblacks, each with its own outstanding advantages. Use them separately, or in combination for greater recipe flexibility. Your Phillips technical representative will be glad to advise on recipes and to help with any operational problem you may have. Prompt, practical, *expert technical assistance* is one of the many advantages of doing business with Phillips. Call your Phillips representative.

LET ALL THE PHILBLACKS WORK FOR YOU!

A — **Philblack A, Fast Extrusion Furnace Black.** Excellent tubing, molding, calendering, finish! Mixes easily. Disperses heat. Non-staining.

O — **Philblack O, High Abrasion Furnace Black.** For long, durable life. Good conductivity. Excellent flex life and hot tensile. Easy processing.

I — **Philblack I, Intermediate Super Abrasion Furnace Black.** Superior abrasion. More tread miles at moderate cost.

E — **Philblack E, Super Abrasion Furnace Black.** Toughest black yet! Extreme resistance to abrasion.

*A trademark

PHILLIPS 66

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HORSE HEAD®

A-420

- HORSE HEAD A-420 is particularly suited for all types of rubber compounding, including latex. It incorporates readily, producing bright whites and clean tints.

- In whitewalls of tires, A-420 contributes free-chalking properties and dynamic flex-crack resistance.

- In rubber compounds designed for low moisture absorption, such as those for electrical applications and mechanical goods(packings), A-420 is frequently employed because of its low water-soluble-salts content.

- Send for a sample now. Check it against your color and brightness standards.

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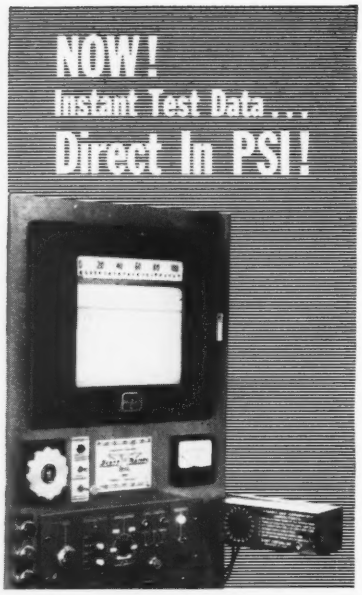


New SPECIMEN DIMENSION COMPENSATOR

For Scott Model CRE Testers and ACCR-O-METER Kits

Easier than a phone call! This new Scott Tester accessory now gives you a quicker, easier, more accurate way to obtain tensile test readings *direct* in psi, kgs/cm², grams/tex or other selected bases — just by turning a dial!

The new Scott Specimen Dimension Compensator automatically adjusts test recordings for dimensional changes in specimen thickness, width, diameter, or cross-section. The operator merely sets the 20-step dial control to the measured variable of the specimen before making the test — the Scott compensator unit does the rest! On special order the number and magnitude of steps may be tailored to suit the job requirements.

The new Specimen Dimension Compensator attaches easily to your Scott Tester . . . swings back out of the way and out of the circuit when not in use. *Any* range (psi etc.) compatible with specimen size and tester capacity may be furnished. Compensator, together with push-button Range Selector, provides *multi-psi ranges* in ratios of 1, .5, .2, .1, and .05. Write *today* for complete details.

Scott Testers Inc., 90 Blackstone St., Providence, R. I. Tel. DExter 1-5650 (Area Code 401).

SCOTT TESTERS

THE SURE TEST . . . SCOTT!

CALENDAR of COMING EVENTS

May 19
Connecticut Rubber Group.

May 21-30
American Chemical Society, St. Louis, Mo.

June 1
New York Rubber Group. Outing. Old Cider Mill Grove, Union, N. J.

June 2
Quebec Rubber & Plastics Group. Golf Outing. Ste. Hyacinthe, P.Q., Canada.

June 3
Connecticut Rubber Group. Dinner-Dance. Longshore Country Club, Westport, Conn.

June 6-8
Instrument Society of America. International Instrument-Automation Conference and Exhibit. Royal York Hotel and Queen Elizabeth Bldg., Exhibition Park, both in Toronto, Ont., Canada.

June 7-8
Tlargi Foundation. Second Annual Technical Conference. Mayfair Hotel, Los Angeles, Calif.

June 9-11
The Los Angeles Rubber Group, Inc. Summer Outing. Stardust Hotel, Las Vegas, Nev.

June 12-September 1
Gordon Research Conferences. Colby Junior College, New London; New Hampton School, New Hampton; Kimball Union Academy, Meriden; and Tilton School, Tilton, all in N. H.

June 13
Buffalo Rubber Group. Outing. Lancaster Country Club.

June 16
Akron Rubber Group. Outing. Firestone Country Club.
Boston Rubber Group. Outing. Andover Country Club, Andover, Mass.

June 23
Detroit Rubber & Plastics Group, Inc.

June 23-24
Southern Rubber Group. Buena Vista Hotel, Biloxi, Miss.

June 25-30
American Society for Testing Materials. National Meeting. Chalfonte-Haddon Hall, Atlantic City, N. J.

June 28-30
Committee D-11, ASTM. Atlantic City, N. J.

August 3-5
Chemical Institute of Canada. Canadian Chemical Conference and Exhibition. Queen Elizabeth Hotel, Montreal, P.Q., Canada.

August 4
Division of Rubber Chemistry, Chemical Institute of Canada. Conference. Montreal, P.Q., Canada.

August 10
New York Rubber Group. Golf Outing. Scotch Plains and Echo Lake Country Clubs.

September 3-8
American Chemical Society. Chicago, Ill.

September 5-8
Division of Rubber Chemistry, ACS. Hotel Sherman, Chicago, Ill.

September 9
Connecticut Rubber Group. Outing.

October 3
The Los Angeles Rubber Group, Inc.

October 5
Detroit Rubber & Plastics Group, Inc.

October 10
Buffalo Rubber Group. Hotel Westbrook, Buffalo, N. Y.

October 13
Boston Rubber Group. Hotel Somerset, Boston, Mass.

October 20
New York Rubber Group, Henry Hudson Hotel, New York, N. Y.
Akron Rubber Group.

November 17
Connecticut Rubber Group.

December 8
Detroit Rubber & Plastics Group, Inc.

December 12
Buffalo Rubber Group. Christmas Party. Buffalo Trap & Field Club.

December 15
New York Rubber Group. Christmas Party. Henry Hudson Hotel, New York, N. Y.
Boston Rubber Group. Christmas Party. Hotel Somerset, Boston, Mass.

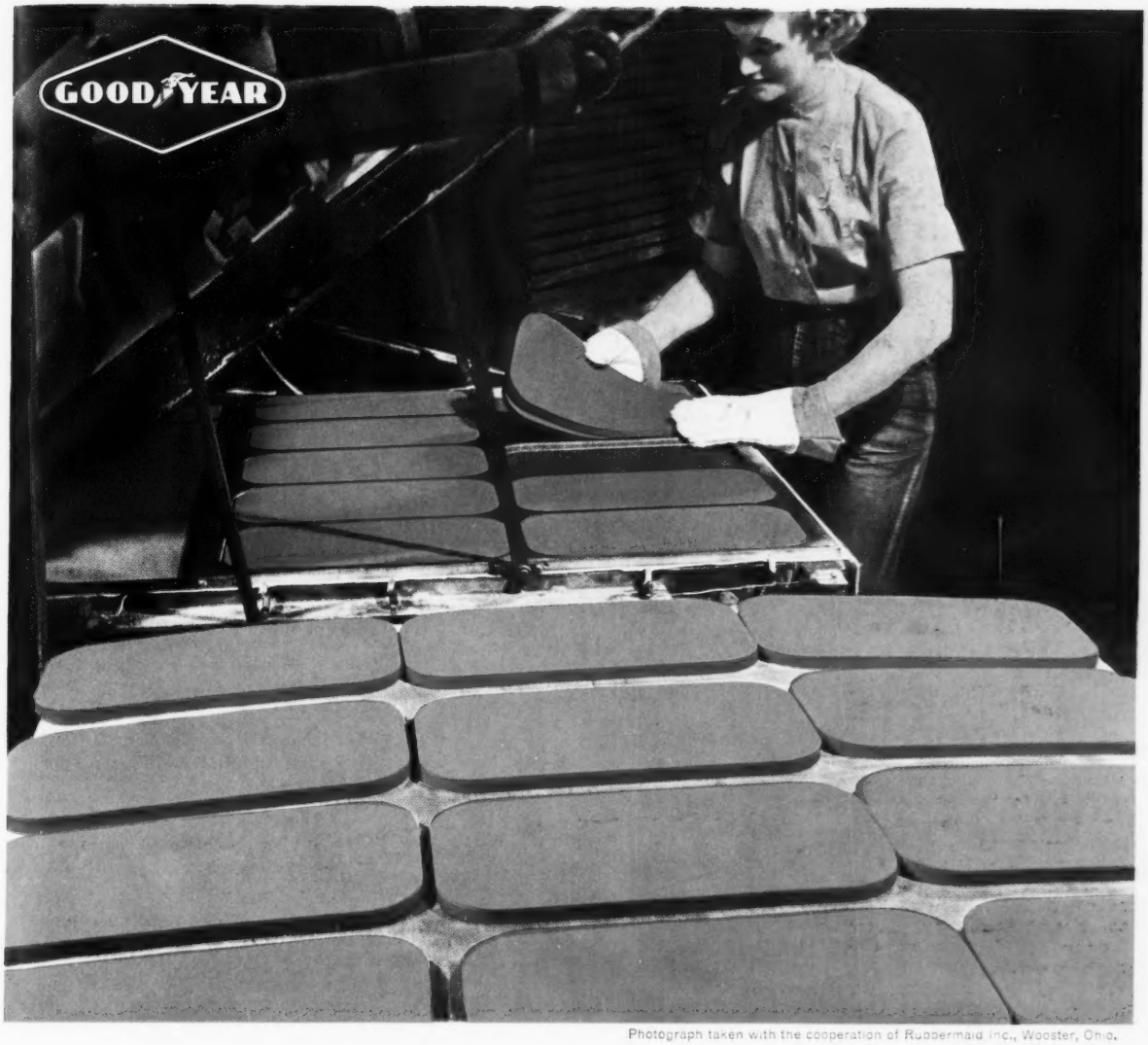
1962

January 26
Akron Rubber Group.

February 6
The Los Angeles Rubber Group, Inc.

March 6
The Los Angeles Rubber Group, Inc.

March 23
New York Rubber Group. Henry Hudson Hotel, New York, N. Y.



Photograph taken with the cooperation of Rubbermaid Inc., Wooster, Ohio.

They're knee-deep in selling points—thanks to PLIOFLEX

A big problem in manufacturing rubber kneeling pads is getting the right physical properties—every time.

The best answer one leading manufacturer found was to use PLIOFLEX 1510. It makes possible a more uniform open-cell structure, better tear strength, and generally superior product quality—*batch after batch.* Just as important, PLIOFLEX 1510 reduces sticking and permits a lower temperature cure during molding. And uncured trim scrap can be effectively reworked, further cutting processing costs.

If you're looking for ways to improve your product—and profit-picture—look closely at PLIOFLEX 1510. For technical details on "1510," or for assistance with your specific problem, just write to Goodyear, Chemical Division, Dept. E-9418, Akron 16, Ohio.

Lots of good things come from

GOODYEAR

CHEMICAL DIVISION

Plioflex—T. M. The Goodyear Tire & Rubber Company, Akron, Ohio

Photograph taken with cooperation of Central Rubber Co., Belvidere, Ill., Henry Pratt Co., Inc., Chicago, Ill., and Austenal Co., La Porte, Ind.

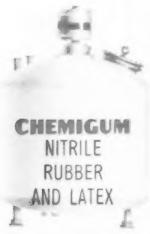
Now they inspect valves–instead of replacing them –thanks to CHEMIGUM

Critical problem for a certain maker of high alloy castings was his material flow valves. Handling of abrasive sand and crushed refractories for his molds wore away metal valve seats in just a few months. And these valves were opened only 3 times a day!

The answer: CHEMIGUM molded valve seats. Result? After a year and a half of *150 openings a day*, the CHEMIGUM seated valves are still giving tight seals. And their initial cost is 25% less!

Why CHEMIGUM? Its unusual toughness and tear strength end abrasion and gouging problems. Its ability to "recover" from compression means tight seals every time. Add outstanding resistance to oils, solvents and chemicals and you know why CHEMIGUM is now used in most of this manufacturer's valve seats.

How can CHEMIGUM help your product? For samples and technical help with your application, write Goodyear, Chemical Division, Dept. E-9418, Akron 16, Ohio.

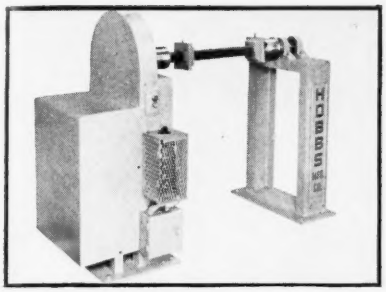


Lots of good things come from

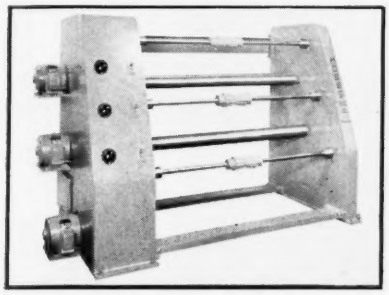
GOODYEAR

CHEMICAL DIVISION

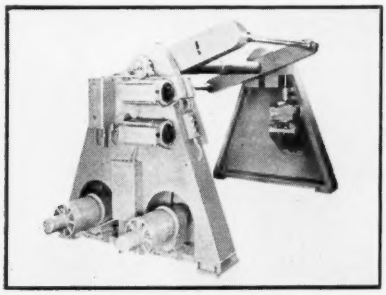
Chemigum–T. M. The Goodyear Tire & Rubber Company, Akron, Ohio



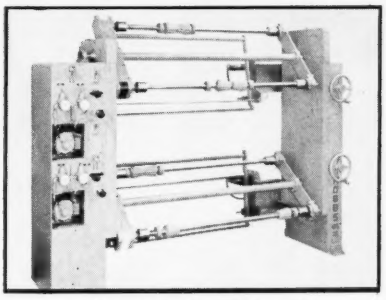
Light Duty Single Shaft Winder



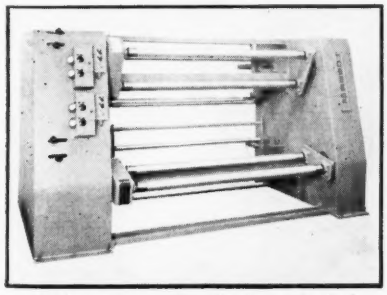
Medium Duty Staggered Three-Shaft Winder



Heavy Duty Two-Shaft Turret Winder with Power Indexing



Light Duty Duplex Winder with Dual Vers-A-Wind Drives



Medium Duty Duplex Winder with Dual Vers-A-Wind Drives and Power Indexing

Looking Ahead in Web-Winding

A TIMELY FACTUAL MESSAGE FROM

HOBBS

With the general business curve again on the upturn and with the corresponding development of immediate needs for capital equipment, Hobbs Manufacturing Company felt the following facts might prove helpful.

How Fast Can Your Company Get Quality Web Winding Machines?

The answer Hobbs has is "Very Fast!". However, Hobbs does not and will not sacrifice the principles of sound engineering of machinery for your particular need in order to short-cut delivery. Hobbs has the man-power and the system to get your quotations to you promptly and accurately wherever you are . . . and Hobbs delivers the equipment it engineers — *as engineered.*

What Makes Hobbs Your Best Source For Web Winding Machines?

The heavy concentration Hobbs places on this machinery and the depth of experience it enjoys in the design and manufacture of web winding machines for plastics, paper, rubber, textiles, etc. make it a source which should always be considered in the purchase of this equipment. Further, Hobbs offers eight basic designs of center shaft web winding machines all of which can be modified to suit your particular requirements.

More For Your Money Now Means More Than Ever

Hobbs has stated that through its superior web winding machine design and engineering it gives customers "more for the money". Now this Hobbs sales theme means more than ever when the requirement is for high quality output machines for competitive prices. Hobbs does not cut price or quality but *does deliver* MORE WEB WINDING MACHINE FOR THE MONEY.

Hobbs Is Ready To Serve You FAST with the BEST In Center Shaft Web Winding Machines.

For Instant Web Winding Quotation Service, Wire:

HOBBS MANUFACTURING COMPANY

60 E. Salisbury Street, Worcester 5, Mass.

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Direct Sales Offices in Irvington, N. J., Columbus, Ohio, Chicago, Ill. and Los Angeles, Calif. Representatives in Cleveland, Ohio, Louisville, Ky., Greenville, S. C. and Toronto, Ontario, Canada.

120-1

WINDERS · HAND & POWER SHEARS · SLITTERS · AUTOMATIC CUTTERS · DIE PRESSES

NOW!...EXTENSIVE TRACTION TESTS PROVE NEOTEX® CARBON BLACKS PROVIDE SUPERIOR SAFETY FACTORS FOR TIRE AND TREAD RUBBERS!

THIS is the story of an important development in automotive safety . . . another Columbian Carbon Company contribution to the tire industry.

Originally NEOTEX Blacks were designed to provide SBR passenger tires with soft ride and low noise; as a channel black replacement; and for natural rubber off-the-road truck tires with superior chipping and cutting resistance. In the course of performance evaluation, it was found that NEOTEX Blacks gave excellent traction.

To determine traction characteristics exactly, tests in the U. S. and Canada have just been completed . . . following, as closely as possible, National Safety Council Test procedures.

Ice traction and skid tests were made on Lake Bernard in the North Bay, Ontario area. Packed snow tests were made on roads in the immediate vicinity. A medium-sized 1961 passenger car, checked for alignment, balance, brakes, and equipped with a 40 mph governor, was used.

Evaluated were SBR rib passenger tires containing ISAF in the control and NEOTEX 130 in the experimental. Also evaluated were SBR snow tires having HAF in control, and NEOTEX 100 in the experimental.

Two types of tests were made:

(1) Traction test consisted of starting car with immediate full acceleration as controlled by the governor from a complete stop, and measuring the stop-watch time to reach a point 20 yards and 120 yards down the course, noting the speed in miles per hour at the 120 yard point.

(2) Skid test was conducted by starting car into the test course at a set speed of 20 miles per hour. At a designated point, hand brake was locked, setting the rear wheels, and skid distance accurately measured in feet.

Results: On clear ice, the NEOTEX 130 rib tire and the NEOTEX 100 snow tires provided 20 per cent better traction than their respective ISAF and HAF controls. Clear ice skid tests were severe for all tires but directional improvements in the range of 6 to 8 per cent for the NEOTEX were noted.

On hard packed snow on an ice base, the NEOTEX 130 tires gave 20 to 25 per cent better traction than the ISAF control and 16 per cent better skid resistance. This 16 per cent improvement at 20 miles per hour amounted to approximately 20 feet.

Hill traction tests conducted on packed snow with an ice base showed the NEOTEX 130 rib tire and the NEOTEX 100 snow tire had excellent times to the 20 and 120 yard markers, with surprising traction on the 8 degree slopes. ISAF rib and HAF snow tire controls were unable to gain traction.

In further hill tests on 15 degree slopes, the NEOTEX 130 rib tire and NEOTEX 100 snow tires climbed with a slow running start and were also able to come to a full stop on the slopes and start again without breaking traction. ISAF rib tire and the HAF snow tire controls were unable to climb the hill, breaking traction even with a slow running start.

Further extensive skid and traction tests are now in progress. For full details, write or wire . . .

COLUMBIAN CARBON COMPANY

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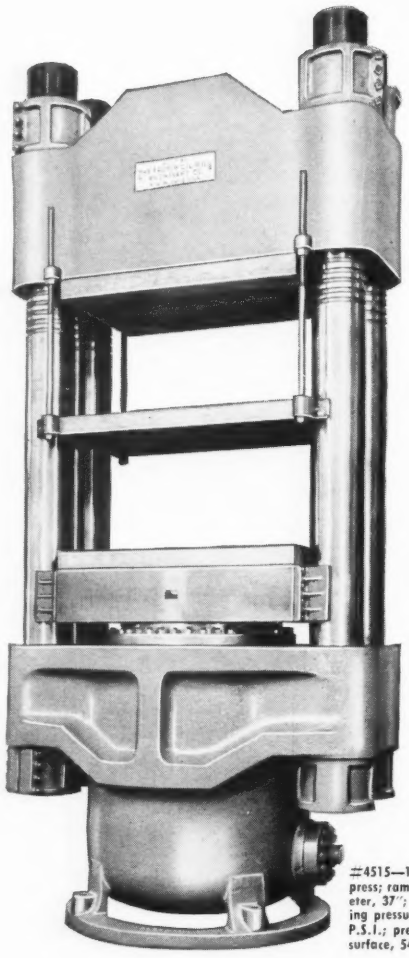

#4515—1613-ton press; ram diameter, 37"; working pressure, 3000 P.S.I.; pressing surface, 54" x 38"

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new materials

Pliovic M-70X—Vinyl Plastic Resin

A new vinyl plastic resin, Pliovic M-70X, designed to lower the viscosity of liquid plastic molding compounds to within practical processing limits, has been introduced by Goodyear Tire & Rubber Co., chemical division, Akron, O.

Compounds made with the new resin have good flow characteristics and improved stability and can be produced at low cost. The resin's relatively small particle size allows latitude in compounding without settling from the plastisol paste and increases adaptability of the resin in coating compounds which must pass through a fixed clearance in processing equipment.

Eccosil—Epoxy-Silicone Rubber Compounds

A new family of epoxy-silicone rubber compounds for potting, impregnating, calking, and molding has been developed by Emerson & Cuming, Inc., Canton, Mass.

Materials currently available are: Eccosil 4850, general purpose, 600° F. temperature capability, used for potting, calking, and mold-making; Eccosil 4640, low weight, 600° F. temperature capability, weighing under 40 pounds cubic feet (sp. gr., 0.6), used for airborne applications; Eccosil 4712, general purpose, 450° F. temperature capability, used for potting applications, retains flexibility after heat aging; and Eccosil 4520, low viscosity, 450° F. temperature capability, for impregnating and dip-coating transformers and coils.

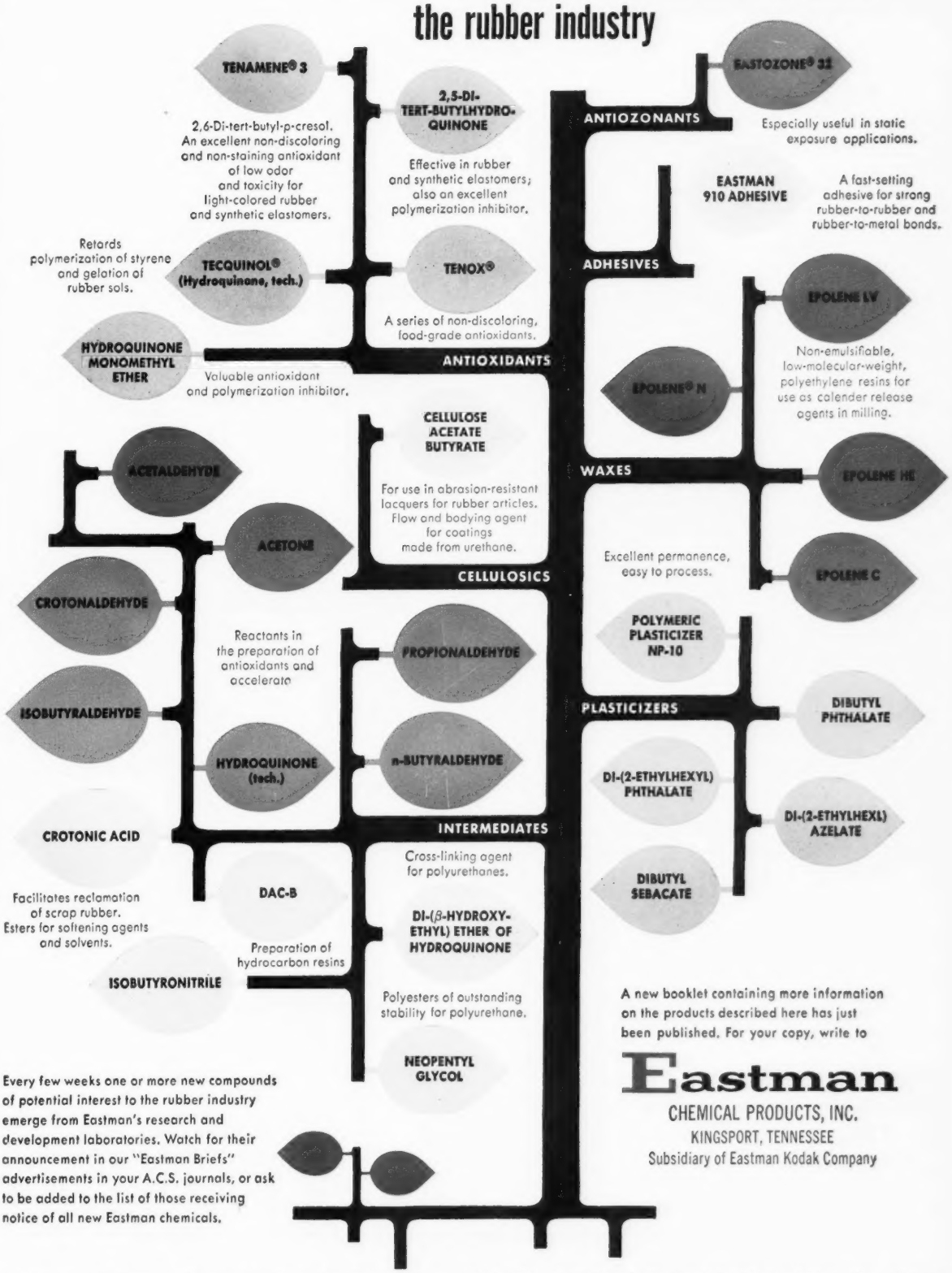
Tinopal SFG—Whitening Agent

Tinopal SFG, a solvent-soluble fluorescent whitening agent for masking yellowness and brightening plastics, coatings, synthetic fibers, and waxes, has been developed by Geigy Industrial Chemicals, division of Geigy Chemical Corp., Ardsley, N. Y.

The new agent, which has a melting point of 201-202° C., absorbs ultra-violet radiation above 300μ and emits this as visible bluish light. Tinopal SFG can be applied to both thermoplastic and thermosetting resins, including poly(vinyl chloride), polystyrene, polyamides, polyesters, acrylates, acrylonitrile copolymers, and polyurethanes.

From Eastman...

A family of fine products to serve the rubber industry



Every few weeks one or more new compounds of potential interest to the rubber industry emerge from Eastman's research and development laboratories. Watch for their announcement in our "Eastman Briefs" advertisements in your A.C.S. journals, or ask to be added to the list of those receiving notice of all new Eastman chemicals.

A new booklet containing more information on the products described here has just been published. For your copy, write to

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SALES OFFICES: Eastman Chemical Products, Inc., Kingsport, Tenn.; Atlanta; Chicago; Cincinnati; Cleveland; Detroit; Framingham, Mass.; Greensboro, N. C.; Houston; New York; Philadelphia; St. Louis. **West Coast: Wilson Meyer Co.,** San Francisco; Los Angeles; Portland; Salt Lake City; Seattle.

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VULCANIZED VEGETABLE OIL
TO YOUR COMPOUND

for High Speed Extrusion and Faster Curing

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The brown types of Factice® are made from various vegetable oils by vulcanizing with sulphur and heat. The choice of the proper grade of brown Factice® to be used in a compound is highly important. The percentage to be used depends on the type of formulation and softness desired.

The brown types are compatible with crude rubber, Neoprene, Buna S and Buna N type polymers. Send us your compounding formula for our suggestions. All formulas held in strict confidence. Our trained staff will help in selecting the proper vulcanized vegetable oil for your need . . . Factice® White, Brown, Neophax or Amberex.

THE STAMFORD RUBBER SUPPLY CO.
STAMFORD, CONN.

new materials

Dow Corning 113—New Silicone Additive

A new silicone additive said to facilitate production of improved polyurethane foams is being marketed by Dow Corning Corp., Midland, Mich. Named Dow Corning 113, the additive offers good stability in storage, in all systems, alone, or in a package premix; less sensitivity to flame retardants, viscosity and color stabilizers, and to variations in mixing; and ease of handling and mixing.

Carboset 511—Acrylic Film-Forming Resin

A new resin known as Carboset 511 has been announced by B. F. Goodrich Chemical Co., Cleveland, O. It is a water solution of an acrylic polymer that dries at room temperature to a clear, tough, glossy, water-insoluble film. Films of Carboset 511 adhere well to metal, glass, paper, leather, and Mylar, polyethylene, and vinyl films. Thin films can be removed with soap, and thicker films with dilute bases.

New Ethylene Copolymer

Union Carbide Plastics Co., New York, N. Y., is marketing a new ethylene copolymer called Bakelite DPDB-6169. The compound has good flexibility over a broad temperature range and high resistance to stress-cracking. Containing no plasticizer, it is easily injection molded, blow molded, and extruded in conventional equipment, it is further claimed. Suggested applications include industrial bellows, diaphragm pumps, moldings, gasketings, and thin-walled and inflatable toys.

Hallcomids—Fatty Amides

C. P. Hall Co. of Illinois, Chicago, Ill., has developed a new series of fatty amides. Called Hallcomids, the compounds are N,N-dimethyl amides of fatty acids having from six to 22 carbon atoms. Recommended as highly polar and soluble, the amides can be used as solvents, additives, and plasticizers.

Peltex—"Viton" Latices

Pelmor Laboratories, Inc., Newtown, Pa., has developed Peltex, a variety of "Viton" latex compositions. Peltex is non-flammable and has the high temperature and oil resistance normally obtained with compounded "Viton," thus permitting thin films, coatings, impregnations, and linings. Standard techniques used for rubber latices may be used with Peltex.

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Making *precision* processing rolls is in many ways an art. Huge as these rolls may be, they require manufacturing skills as delicate as a watchmaker's.

United engineers, metallurgists and roll makers are continually improving the skills they developed more than 50 years ago when they became craftsmen in the manufacture of processing rolls. Leakproof drilled-type rolls—engineered and designed for maximum heat transfer rate—are among the many United roll achievements.

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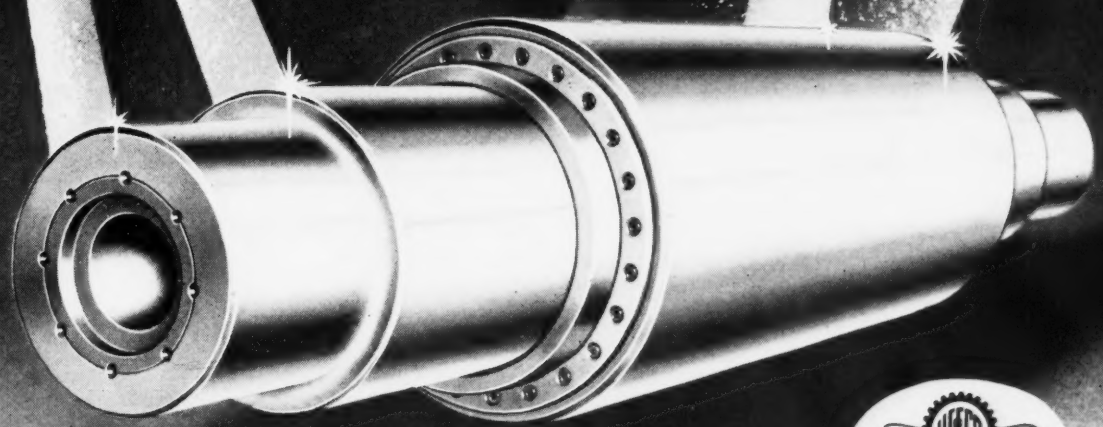

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BALE CUTTERS

★ Automatic ★ Bench Type ★ Standard

A Model For Every Requirement

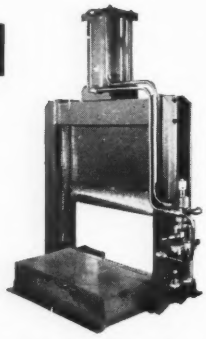
Cut Bales of Crude, Synthetic, Reclaimed Rubber . . . Plastics and Resins.

NEW

FULLY AUTOMATIC 29"

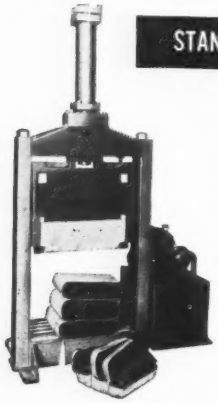
Automatically feeds, measures and cuts bales. Discharges cut pieces to take-away conveyor or tote box. Slice thickness adjustable from 2" to 6". Knife cuts on continuous time cycle or can be manually operated if desired. A fully self-contained unit. Knife 29" — stroke 23".

SMALL BENCH TYPE 24"



For laboratory use or compounding at Banbury.
Cuts full size synthetic Bales or Pre-cut Crude Rubber.
Air Operated cushion action knife actuated by dual electric safety controls.
Easily mounted on Bench or Table — Knife 24" — stroke 12".

STANDARD 29" & NEW 50" MODELS



Cuts without lubricant.
Bales are advanced on rollers and can be cut into 1" minimum slices.
Cutters are manually operated and safety control valve requires operator to stand clear while knife is in motion.
Knife 29" — stroke 23" or knife 50" — stroke 36".

Write for details today — Your inquiries will have our prompt attention.

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ILLINOIS OFFICE: P.O. BOX 328, LA GRANGE PHONE: FLeetwood 4-4811

new materials

SE-5401U—Silicone Rubber Compound

General Electric Co., silicone products department, Waterford, N. Y., has developed a new low-temperature silicone rubber compound designed for use in molded and extruded seals and gaskets. Designated SE-5401U, the compound is a 40-durometer material which possesses a tensile strength of 900, an elongation of 400%, and a tear strength, Die B, 65. Priced at $4.25 per pound in 1,000-pound quantities, SE-5401U is available from stock.

Synpol 8257A

Texas-U. S. Chemical Co., New York, N. Y., has introduced Synpol 8257A, a cold, SBR oil-extended carbon black masterbatch, which contains 75 parts of HAF and 50 parts of naphthenic oil per 100 parts of RHC.

This masterbatch contains a fatty acid soap emulsifier, non-staining stabilizer, and acid coagulant, and it has been developed especially for use in extruded and molded mechanical goods applications that require a non-staining black compound.

New Polyester Resins

Three new polyester resins for applications in adhesive hot melts and as tackifiers, or adhesive components, are being offered by Commercial Resins Corp., St. Paul, Minn.

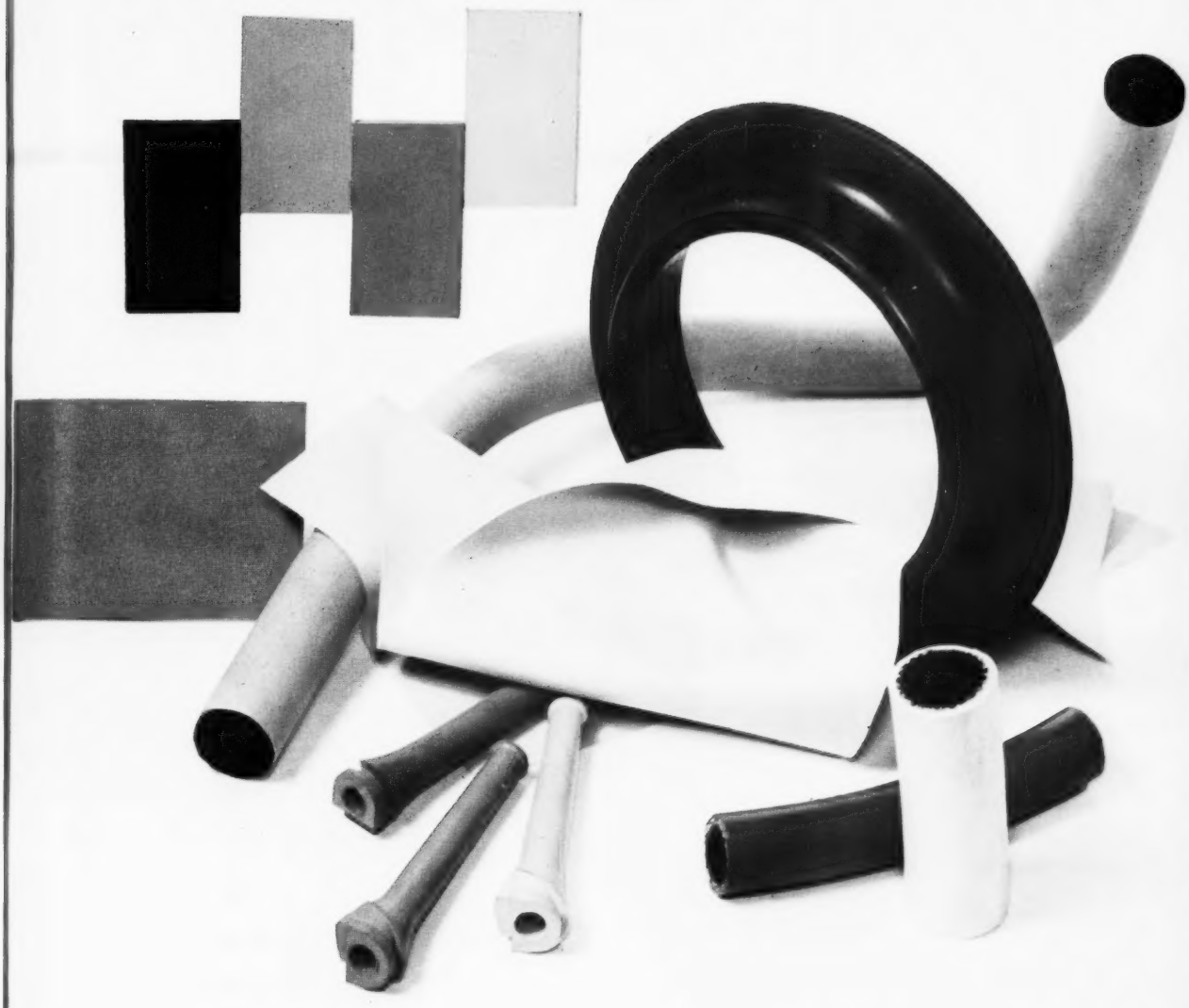
CoRezyn 1 is a thermoplastic, water white, solid, unsaturated orthophthalic, monomer-free resin, which melts at 120-130° F., and has an acid value of 35-40. CoRezyn 2 is a thermoplastic, light yellow, solid, unsaturated, isophthalic, monomer-free resin, which has a higher melting point than CoRezyn 1 and lower acid value. CoRezyn 3 is a heavy, viscous liquid, amber, unsaturated, monomer-free resin recommended for plasticizing CoRezyn 1 and 2.

Pliolite 440, 460—SBR Latices

Goodyear Tire & Rubber Co., chemical division, Akron, O., has introduced two new SBR latices, Pliolite 440 and Pliolite 460, which are recommended for textile and carpet backings, binders for non-woven fabrics, scrim adhesives for carpets, and for saturating and coating applications with paper. Both latices have low viscosity and contain modified chemicals known as carboxylics for faster curing, and an antioxidant for better aging qualities. Chief difference between the two synthetics is that Pliolite 460 imparts more resinous properties which result in stiffer hand or body in the end-product.

Naugatuck PARACRIL OZO

THE OIL-RESISTANT, OZONE-RESISTANT NITRILE RUBBER



. . . tough, oil-proof, weather-proof and colorful, too!

The samples above should begin to give you some idea of the endless color possibilities in ozone-resistant rubber products made of new PARACRIL* OZO. Now you can give your product color that *sells* . . . color that identifies for coding wire and cable jacketing . . . color that blends or *contrasts* . . . color that works in a hundred ways. And you can give your product other superior properties, too.

Along with color, new weather-resistant PARACRIL OZO gives you a combination of high abrasion resistance, oil resistance, flex life and other valuable rubber properties far surpassing conventional weather-resistant rubbers.

Cast a new eye on the rubber product you make or buy. See the difference color makes. See your Naugatuck Chemical Representative or write the address below for full information on PARACRIL OZO and the advantages it offers.

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Division of United States Rubber Company Dept. A Elm Street Naugatuck, Connecticut

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PRIMARY ZnO

Safeguards Quality

The Pennies You Save Using Secondary ZnO *Can Cost You Your Product Reputation.*

Perhaps you can save 2c per hundred pounds of finished rubber when you use secondary ZnO. But here's what our lab tests of secondary ZnO show that you risk:

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LEAD VARIATION .04 to .11	**CAUSES UNPREDICTABLE CURING RATES**
SULPHUR VARIATION .15 to .32	**CAUSES DISCOLORATION**
GRITTY PARTICLES	**CAUSES FAILURE IN THIN-WALLED RUBBER PRODUCTS**

Why Gamble? . . . Use

ST. JOE *Lead-Free* PRIMARY ZnO

- **Made From Same Ore As 99.99 + % Special High-Grade Slab Zinc**
- **"Electronically-Controlled" To Maintain Consistent Analyses**
- **Packed In New Valve-Type Bags—Easier To Handle—Takes 15% Less Storage Space**

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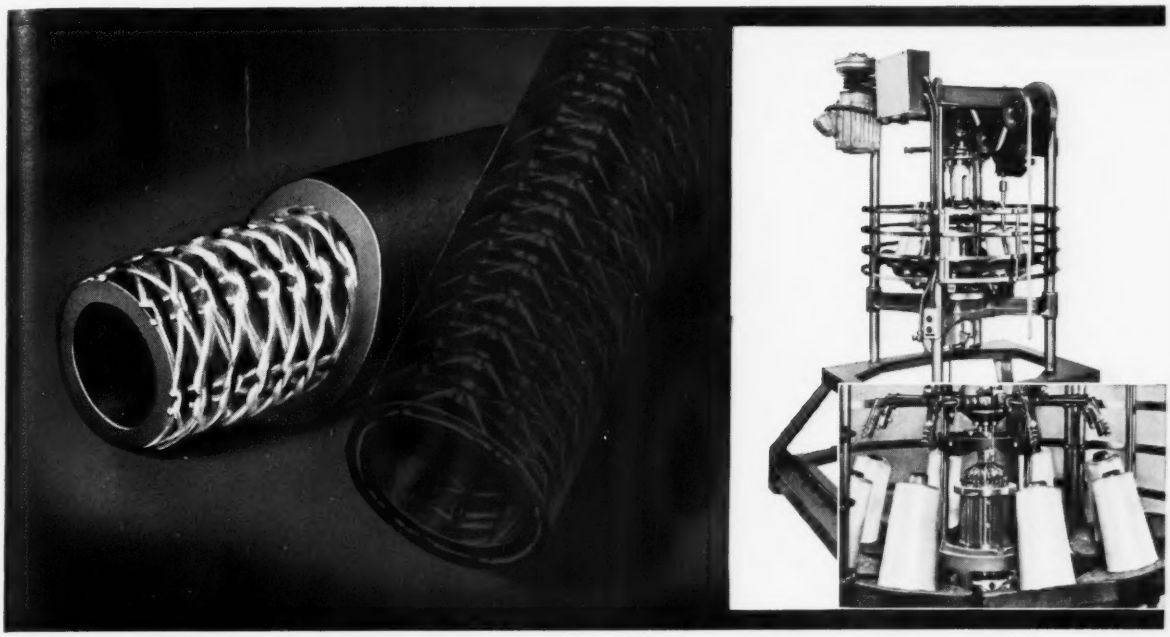

New FIDELITY WRAP-KNIT
Saves Time, Saves Money, Adds Strength

You get these advantages only with the new Fidelity wrap-knit method of hose reinforcement. Use the Fidelity Hose Reinforcement Knitter with *all* natural or synthetic yarns . . . on rubber *or* plastic hose extrusions . . . with ID's from ⅛″ to 2⅜″. Load 64 lbs. of yarn *at one time* . . . complete up to a full day's production without *reloading*.

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Rubber processors across the nation report amazing reductions in mixing and processing time with steam-whipped Gentro-Jet black masterbatch. This time savings means greater production economy . . . higher profits for you. Let us show you how high-dispersion Gentro-Jet can help you make more money . . . write or call today!

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Chemicals for the rubber, paint, paper, textile, plastics and other industries: **GENTRO SBR** *rubber* **GENTRO-JET** *black masterbatch* • **GEN-FLO** *styrene-butadiene latices* • **GEN-TAC** *vinyl pyridine latex* • **GENTHANE** *polyurethane elastomer* • **ACRI-FLO** *styrene-acrylic latices* • **VYGEN PVC** *resins* • **KURE-BLEND** TMTD *masterbatch* • **KO-BLEND** *insoluble sulfur masterbatch*

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Types, grades and blends
for every purpose, wherever
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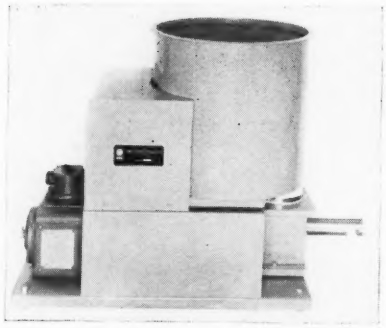
new equipment



Solid materials feeder

Live Bin Feeder Hopper

A new solid materials feeder, which combines hoppering action of the live bin with the metering accuracy of the vibrated rotating screw, has been developed by Vibra Screw Feeders, Inc., Clifton, N. J. Applications include rubber, chemical, electrical, petroleum, plastics, and steel and metals industries.

High-Speed Colorimeter

Allied Research Associates, Inc., colorimetry division, Boston, Mass., has developed the Green-Bartlett colorimeter, which combines an electronic-optical head with a small-scale digital computer to remove the human equation from color matching, sorting, and control.

Designed to provide precise color signatures at rates as high as 30 samples per second, the equipment is suited to feedback process control, continuous color inspection, and high-speed color sorting and grading.

Centerless Grinder

Royal Master Grinders, Inc., Riverdale, N. J., has added to its line a new centerless grinder, Model CG-12-A. Featuring high-speed automatic cycling with positive repeating action, this machine can grind multi-diameter parts as well as balls out of hard rubber, stainless or carbon steel, glass, plastic, wood, non-ferrous metals, and fiber.

(*Continued on page 30*)

Dr. Stanley Jankowski, one of Neville's senior chemists, is shown here holding a test chart showing the results of tensile testing three aged rubber samples. The chart is just as it came from the Instron Tester, except that scribe lines have been inked over and labeled for visibility in the picture. They have not been changed. From left to right, samples contained Neville's R-16 Coumarone-Indene Resin, competitive resin A and competitive resin B. Detailed results are shown below.

Competitive tensile test shows Neville Resin superior

Neville's R-16 Coumarone-Indene Resin was matched against two other leading resins in a neutral colored SBR test recipe compounded for comparative analysis. The results were as follows:

	Average Tensile	Aged Average Tensile	% Tensile Retention
Neville's R-16	1830 psi	1400 psi	76.5
Competitor A	1680 psi	1150 psi	68.5
Competitor B	1655 psi	1275 psi	77.2

Beyond superior tensile strength, there are other benefits derived from compounding rubber with R-16 Neville Resin. Elongation, both before and after aging, is exceptional and considerable aid to processing is enjoyed. Better mold flow and easier dispersion of fillers are also realized in using R-16 Neville Resin. Use the coupon to write for further information.

Neville Products

Resins—Coumarone-Indene, Hydrocarbon (Thermoplastic and Heat Reactive), Hydroxy • **Oils**—Plasticizing, Neutral, Rubber Reclaiming, Shingle Stain • **Solvents**—Aromatic (Refined and Crude), Semi-Aromatic (Refined and Crude). • **Antioxidants**—Non-Staining Rubber • **High Purity Indene** • **Indene Derivatives** • **Crude Naphthalene**

*Trademark

Neville Chemical Company, Pittsburgh 25, Pa.

NEVILLE®

☐ Please send information on Neville Coumarone-Indene Resins.

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COMPANY

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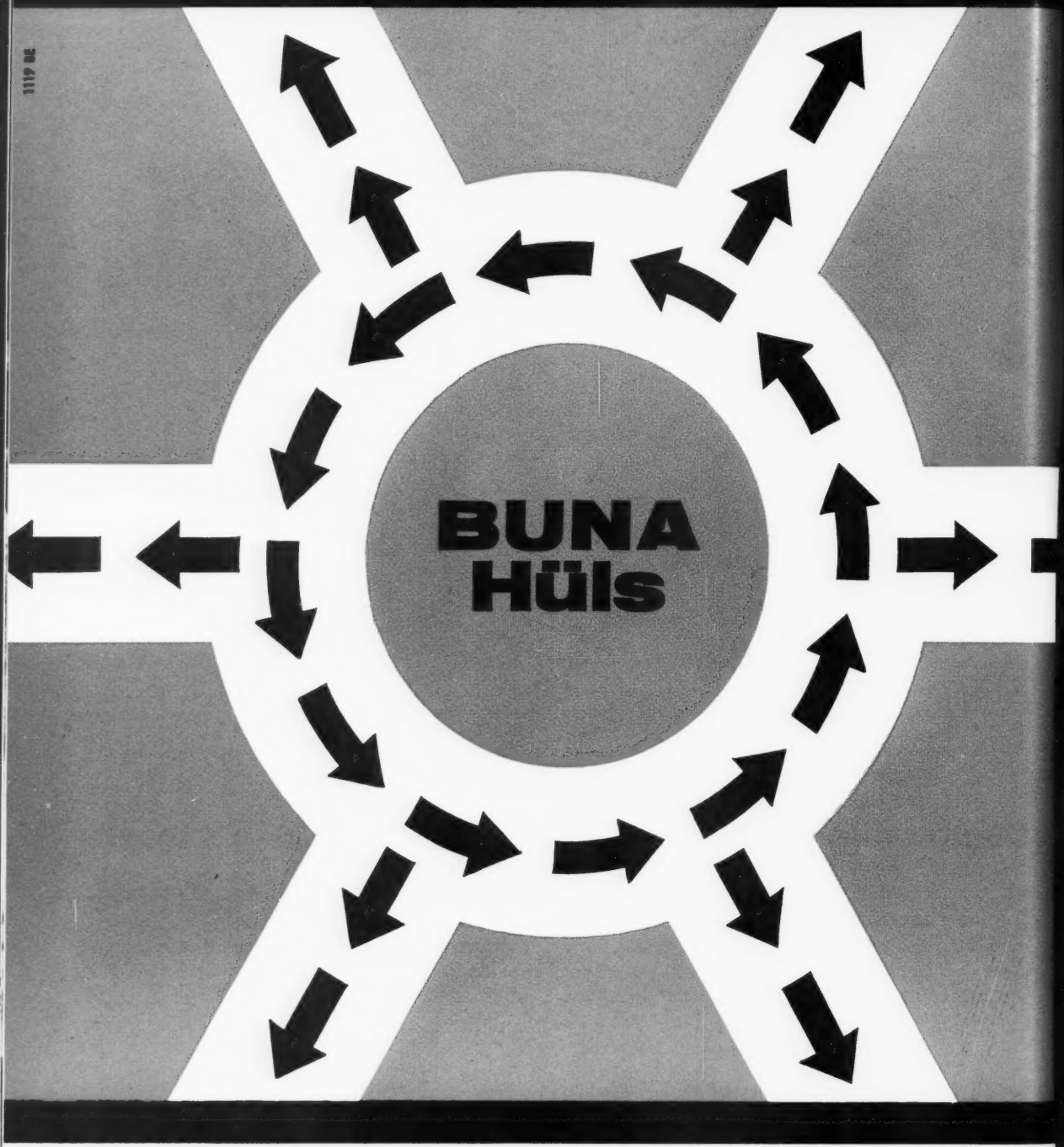

The right grade of BUNA Hüls for every application

Seven standard grades, eight special grades and two types of latex – these comprise the BUNA Hüls range. The right material for every application. Every grade is correctly formulated and quality never varies.

Round-the-clock production at Bunawerke Hüls, coupled with adequate stocks ensure prompt delivery. This reduces storage costs for the processer.

STANDARD GRADES

BUNA Hüls 150
HS, staining
General purpose type, specially suited for manufacture of tyres, conveyor belting, high quality shoe soles, technical mouldings and special items.

BUNA Hüls 152
HS, non-staining
General purpose type for the manufacture of light coloured rubber goods and high quality shoe soles.

BUNA Hüls 153
HS/FS, non-staining
Specially developed for the production of very light coloured and transparent rubber goods and cable insulation.

BUNA Hüls 302
HS, staining, with 37.5 parts oil
Recommended for tyres, retreading, technical mouldings.

BUNA Hüls 362
HS/FS, non-staining, with 37.5 parts oil
Light coloured and transparent grade with good processing characteristics on roll mill and calender; reduced tackiness during processing.

BUNA Hüls 372
HS, non-staining, with 37.5 parts oil
Excellent properties, specially suited for production of light coloured and transparent articles, white walled tyres.

BUNA Hüls 373
HS, non-staining, with 50 parts oil
For the economical production of moulded rubber goods of all types; raw material cost reduced.

SPECIAL GRADES

BUNA Hüls BT 13
HS/FS, equivalent to BUNA Hüls 373

BUNA Hüls BT 21
HS/FS, equivalent to BUNA Hüls 302
The advantage of these two grades is that there is reduced tackiness when processing raw mixes on roll mills.

Types with high Mooney values

BUNA Hüls BT 4
HS, staining; Mooney viscosity (ML_4) approx. 120

BUNA Hüls BT 22
HS/FS, equivalent to BT 4
These grades are especially suitable for the production of heat resistant articles, e. g. high pressure gasketing, brake and clutch linings as well as for flame resistant rubber mixes with high chlorparaffin content; extremely low compression set in the case of grade BT 12; processability of BT 15 better than that of BT 12.

BUNA Hüls BT 12
HS, non-staining, Mooney viscosity (ML_4) approx. 150

BUNA Hüls BT 15
HS, non-staining, Mooney viscosity (ML_4) approx. 130

Types with low Mooney values

BUNA Hüls BT 16
HS/FS, non-staining, Mooney viscosity (ML_4) approx. 40

BUNA Hüls BT 17
HS/FS, non-staining, Mooney viscosity (ML_4) approx. 30
These grades are distinguished by the ease with which they take up fillers, better calendering properties and less shrinkage. Designed for the production of soft, easy flow rubber mixes (e. g. for rubber soles made by moulding direct to uppers); also for sponge rubber.

LATICES

BUNA Hüls 200
HS, staining

BUNA Hüls 220
HS, unstabilised
Used for impregnation of fabrics and tyres cord, also for coating purposes.

HS: rosin acid, FS: fatty acid

BUNA is a registered trademark

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• Saves time
• Cuts costs

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HOLMES GUILLOTINE TYPE CUTTER

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Safe-Hi Valve governs knife blade-protects operator. Manually operated Stock Feed saves time, speeds output, and is an added safety feature.

Because it will--increase production... save time and labor...and...reduce costs--the new and improved Holmes Guillotine Type Cutter will quickly pay for itself in any rubber or plastic plant. Cuts all types of stock--including frozen rubber. One of the safest cutters on the market. Built for long life. Delivered complete--ready to operate. Unusually low in cost.

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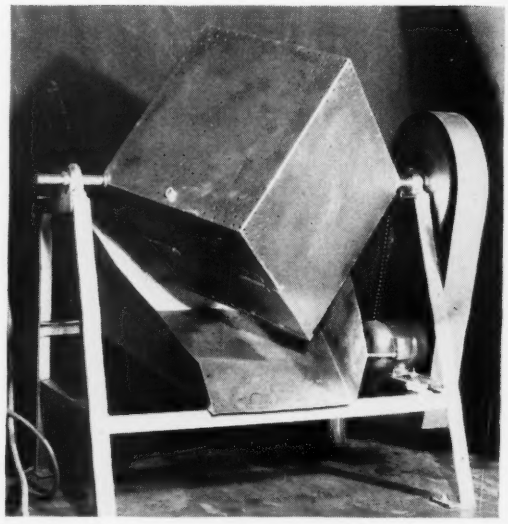
new equipment

(*Continued from page 26*)



Accurate's "Viper" Tumbler

New Tumbling Machine

A tumbling machine for deflashing rubber, plastic, and synthetic parts has been introduced by Accurate Products, Inc., San Diego, Calif. The new machine, which reduces tumbling time required in most deflashing processes by 30%, is called the "Viper" because of its snake-like continuous abrasive motion, which is constant and complete in each tumbling load because of the elongated cube design of the tumbling chamber.

Nuclear Thickness Gage

A new nuclear thickness gage, using beta radiation, has been developed by Ohmart Corp., Cincinnati, O., for applications in industrial research laboratories and pilot-plant operations.

The new gage is useful in the laboratory determination of thickness or density of rubber, plastic films, paper, coated materials, and metal foils. Another application is continuous screening of sheet steel or aluminum being fed into production dies to prevent oversize sheets from damaging the dies.

Pneumatic Oscillator

A new model of the pneumatic Servo-Gauge oscillator has been announced by Associated Control Equipment, Inc., Coraopolis, Pa. Features include a new case suited for panel or surface mounting, and a removable mounting plate for all components; the latter feature facilitates servicing and permitting installation without the case when desired. The instru-

(*Continued on page 46*)

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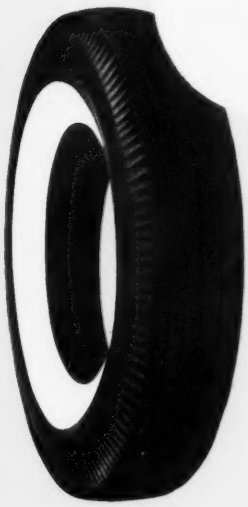
For the exact SHADE OF WHITE

to help you sell your product



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TITANIUM DIOXIDE

Salesmen, sales managers and other marketing people throughout the rubber industry know the difference the *exact shade* of white can make. There are glossy whites, flat whites, non-yellowing whites, striking. "blue" whites, off-whites, transparent whites, non-marking whites . . .

So marketing, as well as production and technical men, are learning the values of Glidden *Zopaque* Titanium Dioxide. *Zopaque* gives you *certain* optical qualities for high opacity, hiding strength and tinting power.

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(This advertisement is printed on paper stock containing Glidden *Zopaque* Titanium Dioxide.)

Call Hall

HALLCO NEWS

Issued by
The C. P. Hall Co.
Chemical Manufacturers

No. 15

USERS REPORT STABILITE GIVES OUTSTANDING RESULTS AT LOWER COST

Unlike the majority of antioxidants, Stabilite shows a measurable beneficial effect on ozone resistance, as reported by a manufacturer of tires used on automotive farm equipment. In combination with a petroleum wax Stabilite further improved anti-checking properties. Another tire company in an airbag application uses 3¼ parts of Stabilite to 100 of rubber hydrocarbon. It obtains these beneficial results:

- **Better splicing due to Stabilite's plasticizing action.**
- **Better adhesion to metal valves.**
- **Better surface condition in use because Stabilite stays smooth longer.**
- **Reduction of circumferential cracking.**
- **Improved handling before curing.**
- **Lower cost.**

Still another tire manufacturer finds that Stabilite, used in the cushion stock containing natural rubber, produces excellent adhesion and shows less tendency for tires to lose their treads. This company credits Stabilite's peptizing action for the improved adhesion obtained. Stabilite added at the beginning of the mixing cycle of GR-S effectively reduces "nerve" and dryness, improves tack and prevents gel formation.

For further information and samples write: The C. P. Hall Co., Akron 8, Ohio, Exclusive distributors for Chemeco, Inc., manufacturers.

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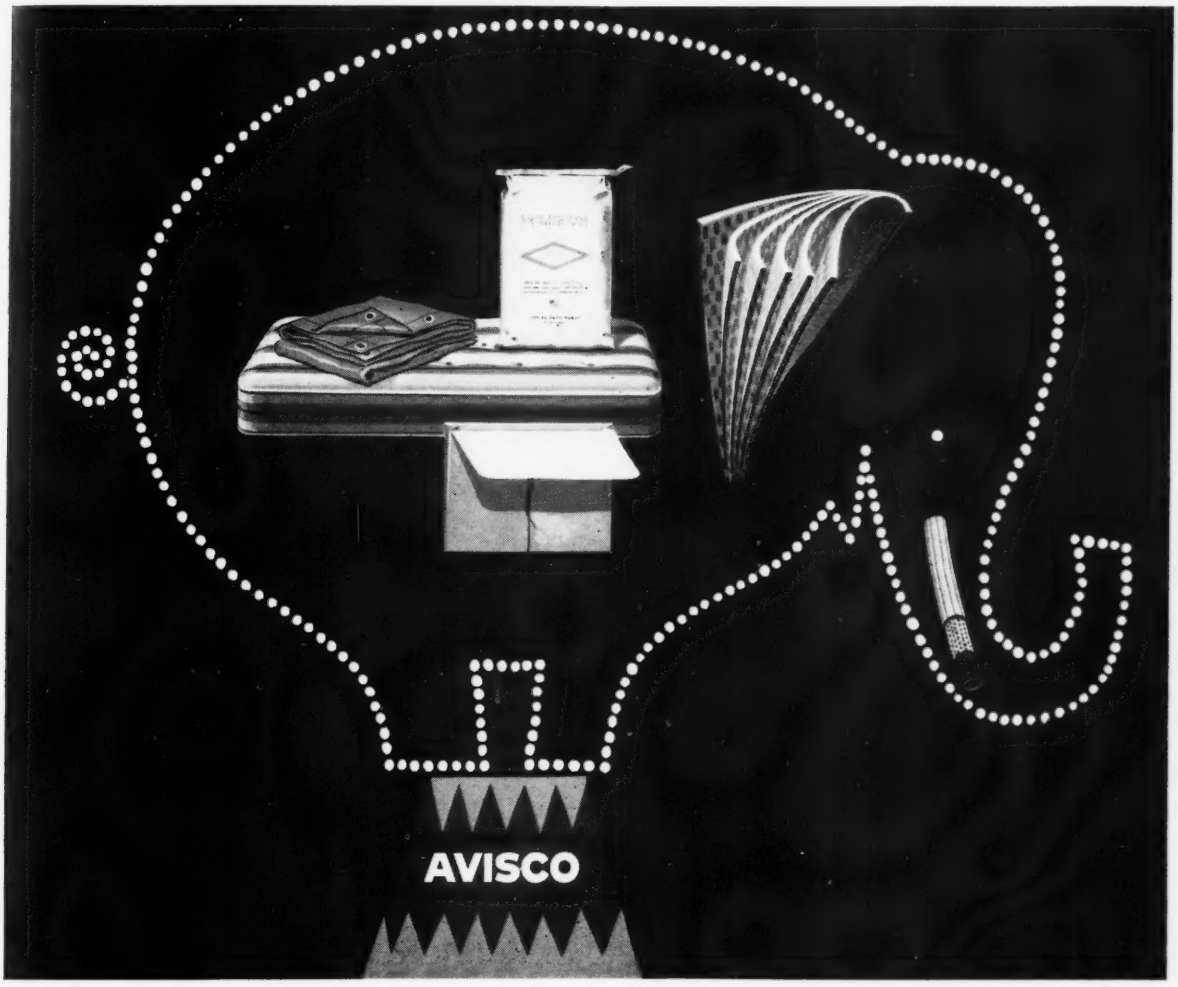
An example of Avisco Rayons in Industry



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Among the applications for Avisco reinforcing rayons are hose and belting, bags and sacks, tarpaulins and covers, child's mattresses and cushions. Many others. Fill out and mail the Quick Reply Coupon at the right for information.

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technical books

BOOK REVIEWS

"Introduction to Natural and Synthetic Rubbers." D. W. Huke. Cloth, 5¼ x 8¼ inches, 164 pages. Hutchinson & Co., Ltd., London, England. Price 25s.

Here is a book with "introduction to" in its title which is precisely that. There are very few places where it becomes too technical or involved for understanding by a reader not familiar with the rubber industry. In fact, it would be an excellent book for pupils at the high school or college level. It should also find great use in laboratories or plants to introduce the new chemist, engineer, or production supervisor to the field of rubber.

While this reviewer would have to take issue with certain statements or descriptions in the book, it is quite well written and is presented in very logical order. The author, in his final chapter, states that he has the feeling that a great many more things ought to be included: new rubbers, additives, and processes to improve the final product, but that a halt had to be made somewhere. It is unfortunate that he stopped where he did. A continuation including new materials and processes written in this simple clear language would be very useful. It is to be hoped that this will be done in any revision or sequel.

The chapters on history and early developments are very well done and clear. Chapters on processing and compounding are not quite so complete. Major classes of compounding materials are included, but many groups of minor ingredients have been left out. This omission may have been deliberate, but it would appear desirable at least to point out their existence. In processing, the areas of mixing, extruding, calendering, and some molding features are covered adequately. Raw stock preparation, mold and open steam vulcanization, and finishing steps should have been added, or existing sections expanded.

The section on stereo synthetic natural rubbers is particularly weak. There is no indication that these rubbers are in commercial production, and the author passes over polybutadiene as if it were still a lab curiosity.

This book is not a compounding guide, but a general description of natural rubber and most common synthetic rubbers viewed in the light of historical and chemical development with some practical aspects worked into this theme. In spite of certain drawbacks, as listed above, this reviewer would rec-

Many of you have told us how pleased you are with the quality and performance of Copolymer products. This is our basic goal; but we, ourselves, are never quite satisfied. Our guiding principle is that there is always a better way to make a better product. And, it's my job as Technical Manager to see that the consistent quality and performance of our products will continue to please you.

We have come a long way in the 18 years since Copolymer first began operation. During this time we have been fortunate in developing many "firsts" for the synthetic rubber industry. These developments were the result of teamwork by many people who, like myself, had received valuable first-hand experience with problems in the rubber and petro-chemical industries long before Copolymer was born.

The basic requirements for a good product are *uniformity* and *consistency* of product performance. We believe our Technical Department has the background and ability to recognize the importance and necessity of these fundamentals.

Our testing facilities and process control techniques are constantly examined and improved to keep pace with the rapidly-changing needs of the rubber industry. And, as new discoveries in the industry increase the demand for new products—and better ways of making existing products, we at Copolymer stand ready to meet the challenge and responsibilities of continued leadership in their development.

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Three leading tire manufacturers recently proved, in a series of tests, that RECLAIMATOR rubber adds weather resistance to their tires. In both a dynamic and a static test the tire sidewall compound contained 19% of RECLAIMATOR reclaimed rubber, and was compared pound for pound with the best matching conventional reclaims. Results of both tests show that tires made with conventional reclaims had many weather cracks on the sidewall, but sidewalls of tires containing RECLAIMATOR reclaim had practically none.

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technical books

ommend this book particularly for the younger or inexperienced person.

"Infrared Spectroscopy, Its Use as an Analytical Tool in the Field of Paints and Coatings." Paper. 7¾ by 5¾ inches. 160 pages. Chicago Society for Paint Technology, 1350 S. Kostner Ave., Chicago 23, Ill. Price $2.75.

This handbook, an abstract of which was presented at the thirty-eighth annual meeting of the Federation of Societies for Paint Technology in Chicago last October 31, is designed to assist the chemist who is unfamiliar with infrared methods of analysis.

A chapter on basic spectroscopy theory is followed by chapters on preparation and care of samples, and one on practical quantitative analysis by means of infrared spectroscopy, illustrated with sample spectra. A collection of nearly 200 spectra, for reference purposes, completes the handbook. This is a clear, basic treatment of a complex subject which should be of considerable use, with a lengthy bibliography for anyone who wishes to go into the subject more deeply.

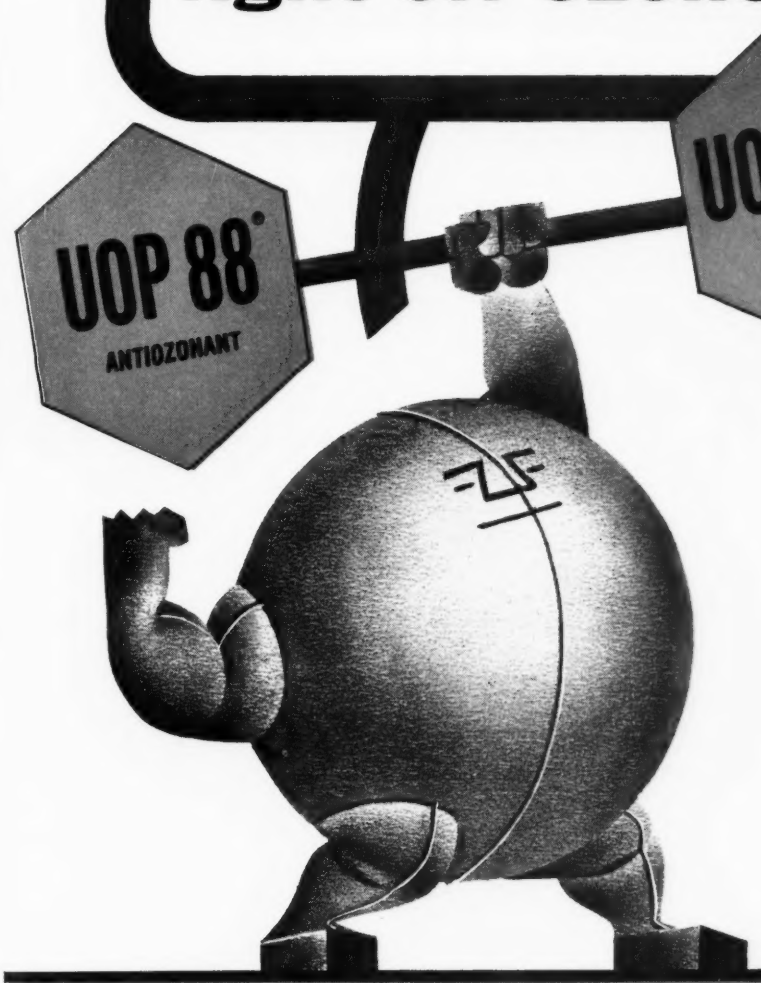
NEW PUBLICATIONS

"Surface Treated Zinc Oxide for Rubber." Rubber Bulletin No. 1. St. Joseph Lead Co., Monaca, Pa. 10 pages. This bulletin reviews properties of coated zinc oxide versus uncoated zinc oxide in regard to properties of cured rubber stocks, dispersion, Banbury incorporation, power consumption, mixing times, cure times, plasticity of stocks, water absorption, and electrical properties.

"Dynamic Properties of Cis-4 Polybutadiene-Natural Rubber Blends." Rubber Chemicals Sales Bulletin No. 35. Phillips Chemical Co., Akron, O. 3 pages. This bulletin compares physical properties of natural rubber with blends of Cis-4 polybutadiene in various ratios and concludes that the blends have increased resiliency, low heat generation, and great resistance to degradation during severe flexing, high dynamic modulus, lower compression set and permanent set, superior retention of stress-strain properties at elevated temperatures, better scorch resistance, and better overcure resistance, as compared with natural rubber.

"Enjay Butyl HT 10-66." Enjay Chemical Co., Butyl Division, New York, N. Y. 72 pages. HT 10-66 is a chlorinated butyl with rapid cure and compatibility with other elastomers. This bulletin details chemical structure, cure systems, properties of vulcanizates, cures and properties of blends with SBR, natural rubber, neoprene, nitrile rubber, and reclaim, compounding for various applications, processing, and applications.

how can rubber under STRESS fight off ozone attack?



The test strips below, both of identical composition including kind and amount of antiozonant, were exposed to 30 pphm ozone at 100° F for 2 weeks at different elongations.

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In working out rubber formulations involving the use of antiozonants avail yourself of UOP technical service and facilities. Just write or telephone our Products Department.

The specimen on left, subjected to 20 percent elongation, shows severe ozone cracking.

Specimen at right, subjected to 10 percent elongation, shows no sign of ozone cracking.

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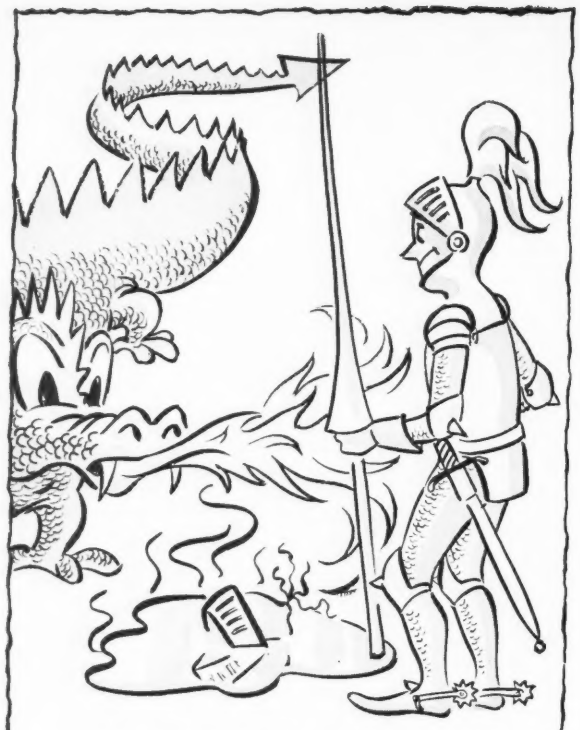

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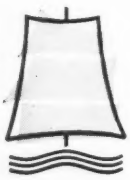

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technical books

"Carbowax Polyethylene Glycols." Union Carbide Chemicals Co., New York, N. Y. 65 pages. This booklet contains data on properties and applications for Carbowax polyethylene glycols 200, 300, 400, and 600, which are liquids, 1000, 1500, 1540, 4000, and 6000, which are solids, and Carbowax methoxy polyethylene glycols 350, 550, and 750.

"Silicones." CDS-129C. General Electric Co., Silicone Product Department, Waterford, N. Y. 8 pages. This bulletin contains data on properties and applications of G-E silicone fluids, silicone protective coatings, silicone electrical insulation, and silicone rubbers, including liquid RTV and LTV rubbers.

"A Selected Listing of Testing Machines for All Industries." Testing Machines, Inc., Mineola, L. I., N. Y. 20 pages. This listing covers 461 testing machines manufactured by a number of companies, in the United States and abroad, in 69 categories of physical testing.

Publications of American Cyanamid Co., Rubber Chemicals Department, Bound Brook, N. J.

"ZMBT." This brochure describes properties and applications of a medium-temperature accelerator for natural rubber and SBR stocks for wire insulation, rubber thread, latex foam, and latex specialties.

"Pepton 65 Plasticizer." This bulletin describes a catalytic plasticizer for low-temperature plasticization of natural rubber and SBR, and full-temperature plasticization of polyisoprene.

Publications of Naugatuck Chemical Division, United States Rubber Co., Naugatuck, Conn.:

"GMF-SD and Dibenzo GMF-SD." 5 pages. This bulletin describes super dispersing forms of p-quinonedioxime, a vulcanizing agent, giving compounding information and properties.

"Tuex and Ethyl Tuex." Compounding Research Report 31-A. This report describes uses of Tuex and Ethyl Tuex as curing agents and accelerators.

"Storage and Handling of 2-Nitropropane." Bulletin NP TDS No. 7. Commercial Solvents Corp., New York, N. Y. 4 pages.

"Industrial Rubber Products." Cincinnati Rubber Mfg. Co., Cincinnati, O. 60 pages.

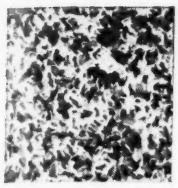
"Tire and Rim Association 1961 Yearbook." The Tire & Rim Association, Inc., Akron, O. 178 pages. $3.50.

"Okonex Insulated Cables." Bulletin 1131. Okonite Co., Passaic, N. J. 48 pages.

"Vibra Screw Live Bin Feeders." Vibra Screw Feeders, Inc., Clifton, N. J. 4 pages.

"Elastomer-Fabric Diaphragms." Diaphragm Industries, Inc., Beverly, Mass. 4 pages.

"Shadograph Scales." Catalog Form 3333. Exact Weight Scale Co., Columbus, O. 8 pages.



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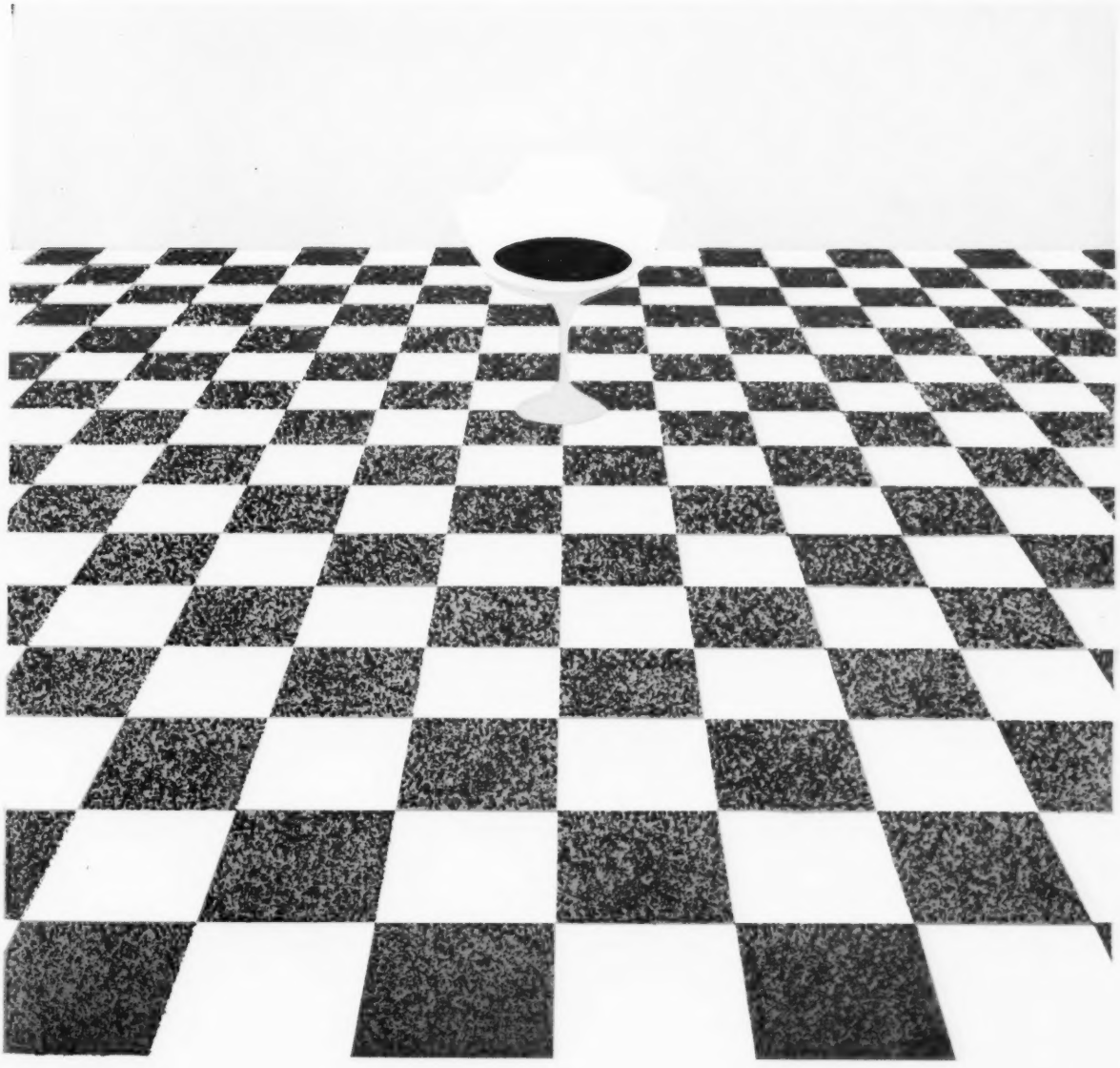

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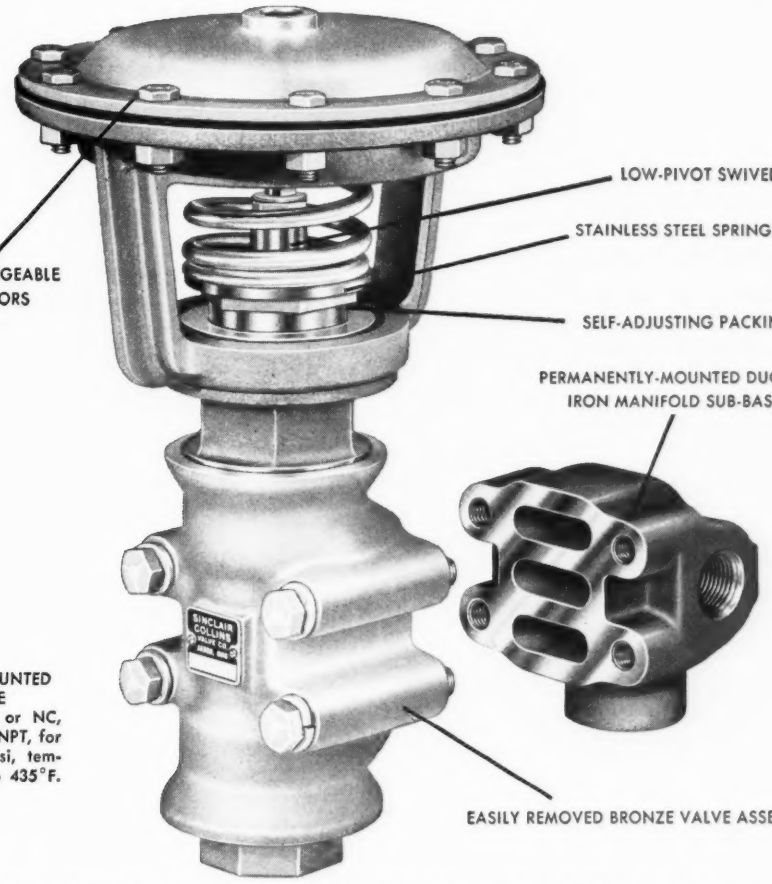

S-C MANIFOLD-MOUNTED STEAM VALVE
2- and 3-way NO or NC, tapped ½- or ¾-in. NPT, for pressures to 350 psi, temperatures from 0 to 435°F.

Want excellent flow characteristics and bubble-tight sealing? Want maximum service life and minimum downtime for maintenance? Want compact, versatile design and ease of installation? Then you'll specify Sinclair-Collins' new manifold-mounted steam valve.

S-C's low-pivot hollow swivel stem places the pivot point *within* the extra-long bearing area to minimize side thrust and wear . . . provides maximum packer life. Self-adjusting spring-loaded Teflon chevron packing requires no attention. Piloting of all assembled components eliminates misalignment of stem. These features, plus Sinclair-Collins' precision manufacturing techniques are your assurance of long trouble-free valve life.

What's more, S-C's new valve can be converted from NO to NC, or vice versa, by rotating it 180° on the manifold sub-base.

Some day, maintenance will be necessary . . . it's simple . . . just loosen four mounting bolts, remove the valve for later bench servicing and install a replacement . . . downtime can be measured in minutes!

Find out how this advanced design valve can improve the performance of machines you have in service or on the drawing board. Your Sinclair-Collins field engineer has all the details.

For more information, write for free Bulletin MV-60. Address The Sinclair-Collins Valve Company, 454 Morgan Avenue, Akron 11, Ohio, Dept. RW-561

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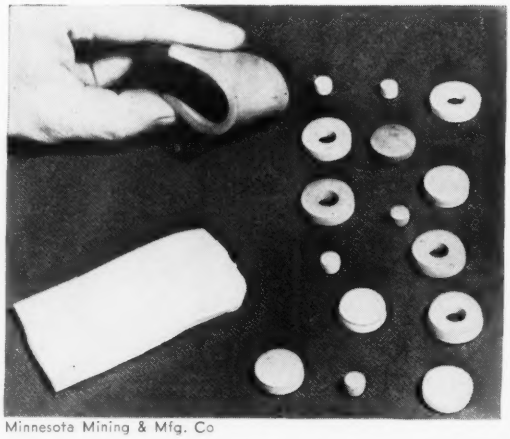


Minnesota Mining & Mfg. Co

Closed-cell elastomeric sponge and some applications

Closed-Cell Sponge

A new closed-cell sponge that offers good resistance to chemicals, acids, and fuels and has high dielectric strength and a broad temperature range has been developed by Industrial Electronic Rubber Co., Solon, O.

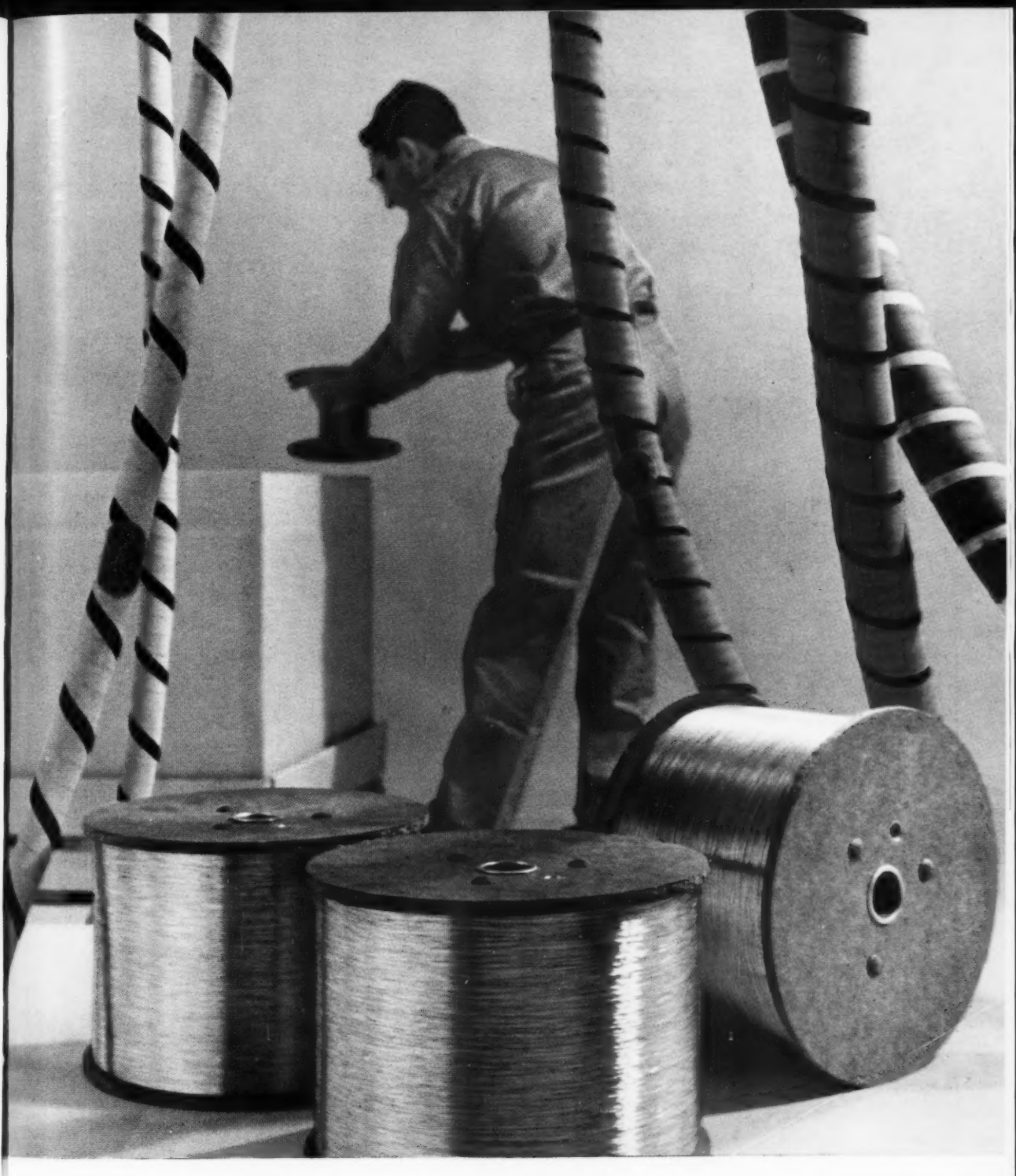
The sponge, molded from "Fluorel" 2141 Elastomer, is said to compare in hardness to a very soft rubber with about a 20-durometer (Shore A) rating, yet retain the inert characteristics of "Fluorel" 2141 Elastomer. The blown version has about a fourth the density of the solid elastomer.

Possible areas of application include: gaskets, seals, and plugs for applications in which resistance to grease, oil, and commercial gasoline is required; gaskets and seals in the presence of perchloroethylene, commonly associated with degreasing or dry-cleaning operations; and vibration dampening in critical applications for the missile and rocket industries.

Bostik 1142—Synthetic Rubber Adhesive

Bostik 1142, a fast-drying synthetic rubber adhesive, has been introduced by B. B. Chemical Co., Cambridge, Mass. It is recommended for adhering to steel, aluminum, brass, glass, neoprene, SBR, nitrile, phenolic, urea, polystyrene, urethane, sponge rubber, and enameled surfaces.

(*Continued on page 46*)



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When you buy Roebling Hose Reinforcing Wire it is delivered to you on no-charge spools that mean savings to you.

This modern method of packaging does away completely with deposits and the bookkeeping involved; it contributes, too, to lower freight costs and saves storage space. Thus, you avail yourself of a precision-made and quality controlled product, without any handling, shipping and inventory inconveniences.

Roebling Hose Reinforcing Wire, used for braiding reinforcement, is produced in a complete range of sizes. Write Roebling's, Wire and Cold Rolled Steel Products Division, Trenton 2, New Jersey, for details.

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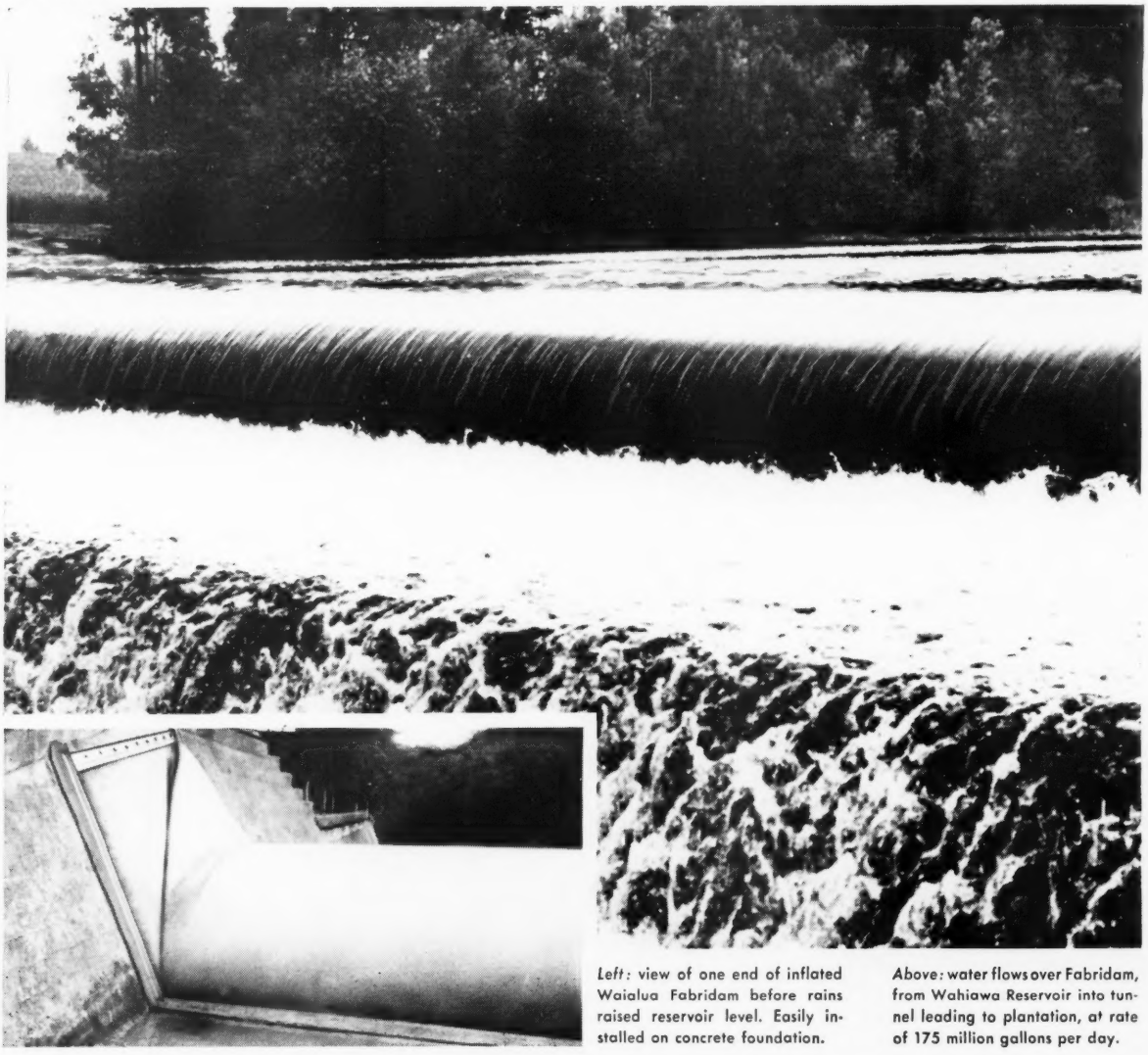

Left: view of one end of inflated Waialua Fabridam before rains raised reservoir level. Easily installed on concrete foundation.

Above: water flows over Fabridam, from Wahiawa Reservoir into tunnel leading to plantation, at rate of 175 million gallons per day.

Irrigating the ten thousand acres of sugar cane under cultivation by the Waialua Agricultural Company, Ltd., of Waialua, Hawaii, takes more than 25 billion gallons of water a year. To conserve extra water available during wet periods, a remarkable new "Imbertson Fabridam by Firestone" was installed in the spillway of the Wahiawa Reservoir.

Far less costly than conventional control gates, this light, flexible fabric dam increases the storage capacity of the reservoir by 500 million gallons. During the rainy season, it automatically deflates sufficiently to prevent flooding.

Wellington Sears supplied the nylon base fabric used by the Coated Fabrics Division of The Firestone Tire & Rubber Company for the Fabridam. With a tough neoprene coating, it has outstanding resistance to deterioration from age and abrasion—for a life expectancy of 15 years.

This is but another demanding use which Wellington Sears fabrics serve. We have wide experience in engineering cotton and synthetic fabrics to specific jobs—and are always ready with sound technical assistance. For a copy of our illustrated booklet, "Fabrics Plus," write Dept. H-5.

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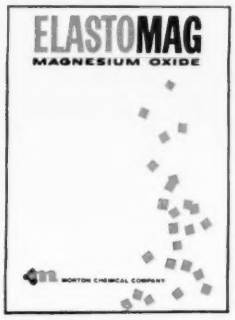
Three activity grades give you ideal process safety for every type of recipe

Cut down on costly throw-away loss caused by scorch. Get better bin stability . . . better states of cure by using an *activity-controlled* ELASTOMAG oxide from Morton. Three precision activity grades of ELASTOMAG—170 (high), 100 (medium), and 20 (low)—let you choose the oxide with a Morton Activity Index (MAI) that's ideal for every stock. New ELASTOMAG Micro-Pellets eliminate dusting problems. No binder or treating agent is used. In the mixer, Micro-Pellets break down to minute particles . . . provide the same superior dispersion as ELASTOMAG in the powdered form.



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Further information or technical assistance available upon request.

COOKE Color & Chemical Co.

GArden 5-5935 Hackettstown, N. J.

new products

(Continued from page 42)

Goodyear Tire & Rubber Co., Akron, O., is now marketing a water suction hose designed especially for use where hose is subject to damage from truck movements. Designed with a special rope helix, the hose can return to its original shape after being crushed. The helix also prevents collapse of the hose at high vacuum

Coated Hospital Sheeting

A hospital sheeting constructed of Dacron coated with neoprene, has been introduced by Aldan Rubber Co., Philadelphia, Pa. The sheeting is said by Aldan to be durable and lightweight and resistant to oils, acids, alkalies, and body excretions, as well as being fire and abrasion resistant. In addition, the company says, the sheeting is more flexible and has a more pleasant hand than standard sheeting, is considerably thinner, and will fold smaller for more compact storage.

New Tread Rubber

Firestone Tire & Rubber Co., Akron, O., is marketing a new tread rubber called "Micro Blend." The result of a new liquid mixing process for blending ultra-fine carbon black with rubber, the tread rubber is lightweight and gives long wear. This tread rubber, in various blends, is made for truck, passenger-car, and off-the-highway, aircraft, and racing tires.

Pneumatic Oscillator

(Continued from page 30)

ment is a pneumatically actuated timer without moving parts or electrical connections. Its signalling impulses are adjustable in frequency between 0.3 and 60 cycles per minute.

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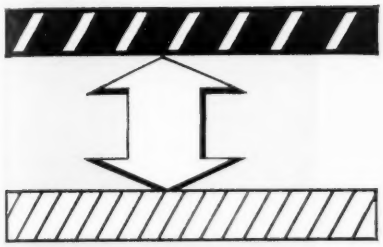

if you bond uncured rubber to metal here are

FIVE WAYS CHEMLOK® ADHESIVES CAN CUT YOUR COSTS

VERSATILITY...

Chemlok 220/203 system bonds natural rubber, SBR, butyl, neoprene and nitrile elastomers to all metals and many rigid plastics. No need to inventory several adhesives. You also save storage space and avoid errors in adhesive application.

LESS SCRAP...

Chemlok Adhesives produce rubber-tearing bonds consistently. You save through fewer rejects, fewer bond failures, improved product acceptance.

ONE COAT...

Single coat of Chemlok 220 outperforms most two-coat systems, gives equivalent environmental resistance. You save through less adhesive, less labor, shorter processing time.

BROAD TOLERANCE...

Chemlok Adhesives permit wide latitude in compounding, surface preparation, adhesive application, metal parts handling and molding techniques. Adaptable to existing processing methods and equipment. You save through faster handling, simpler processing, standardized procedures.

BETTER QUALITY...

Chemlok Adhesives give uniform, high-strength bonds with maximum service life and environmental resistance. You save the high cost of customer complaints and lost business.

How Chemlok Adhesives cut costs at Johnson Rubber Co.

"We get 80 to 90% better bonding results with Chemlok 220 and 203," reports Mr. George Green, Lab Supervisor at Johnson Rubber Co., Middlefield, Ohio.

"Chemlok Adhesives permit us to stock only one bonding agent where formerly we had a different one for each type of rubber. This saves on equipment and space, also reduces adhesive storage areas and costly inventories."

Using Chemlok 220 and 203 for automotive parts, Johnson Rubber achieves longer product life, more uniform bonding, and better consistency with easier control and up to 20% less scrap.

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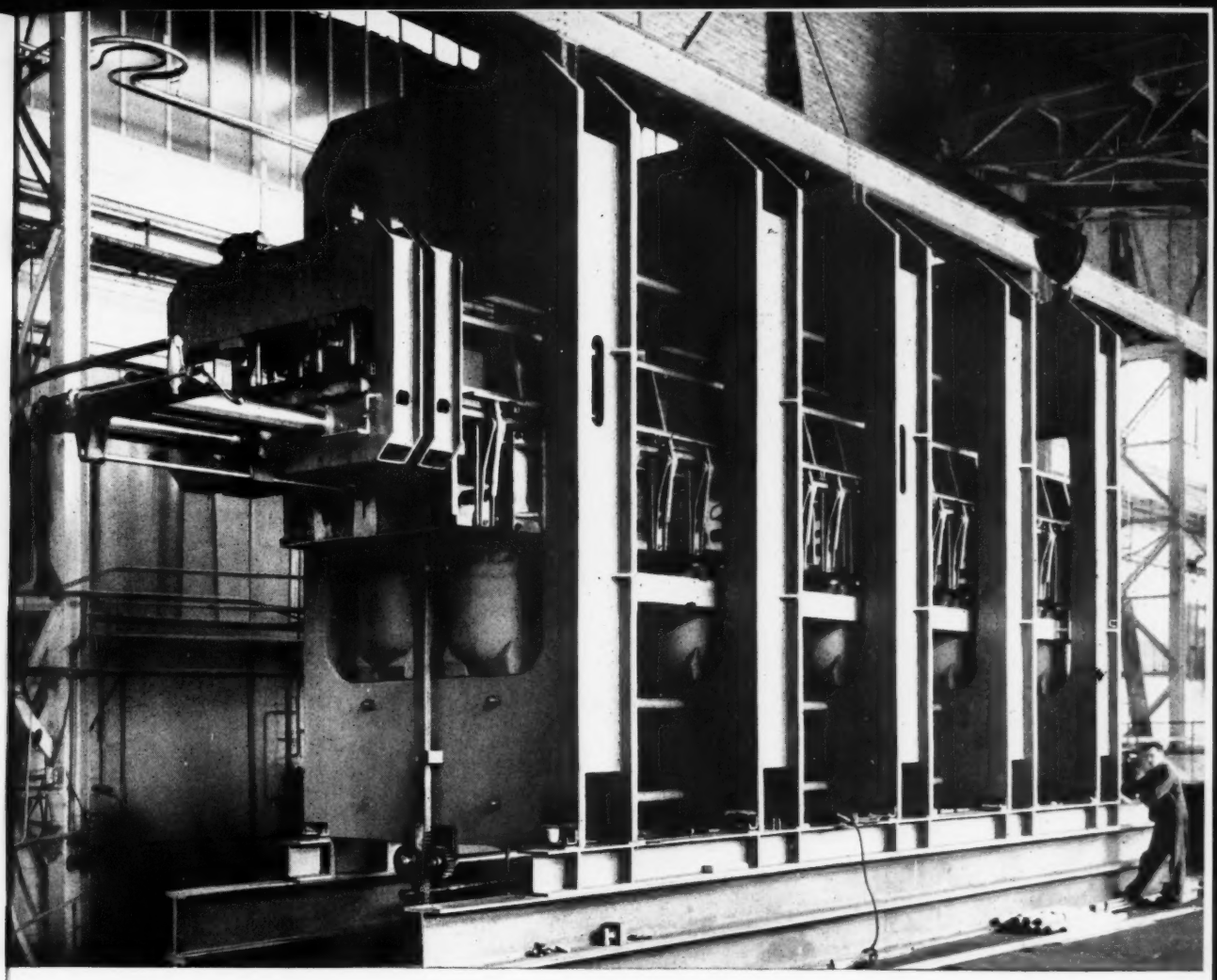

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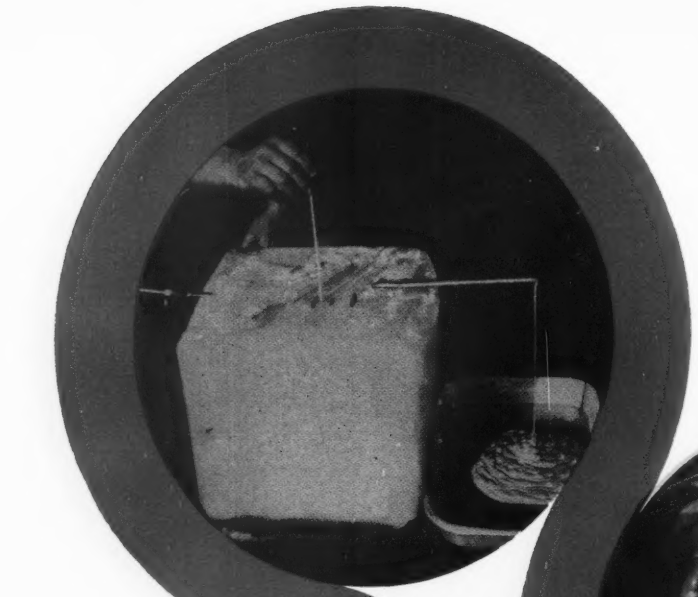

Mobilplex EP grease has good pumpability over wide ranges of temperature and shear rates. Here, Mobilplex EP is pumped through a 24-foot coil of ⅜" tubing frozen in ice at 15 F . . . remains pumpable, permits continuous delivery even at critical pumping rate.

Mobilplex EP resists both water wash and runout caused by heat. In this demonstration, an immersion heater is used to boil water in a conventional mesh vegetable strainer coated with Mobilplex EP. Grease maintains a water-tight film even under these adverse conditions.

Mobilplex EP gives extra protection against wear under heavy and shock loads. Here, two split "bearings" consisting of V-shaped bushings are clamped under equal pressure on a polished steel shaft. The front bearing is lubricated with Mobilplex EP; the rear bearing with a high quality non-EP grease. When bearings are reciprocated in opposite directions, the shaft turns with the rear bearing, indicating frictional resistance is greatest at this point.

EVALUATION SUMMARY
MOBILPLEX EP ( ) and 5 Leading Competitive EP Greases (A,B,C,D,E)

PROPERTY EVALUATED	RATING			
	Excellent	*Good*	*Fair*	*Poor*
Heat Resistance	M	A	C,D,E	B
Service Performance	M	A,C,E	B,D	
Extreme Pressure	M ,A,C	B,D,E		
Anti-Wear	M ,A	B,C	D,E	
Rust Protection		M ,B,C, D,E		A
Water Resistance		M ,B,C	A,D,E	
Handling Properties		M ,A,B C,D,E		
Controlled Bleeding		M ,A,C	B,D,E	
Non-staining		M	A,B, D,E	C

This chart summarizes results of an extensive evaluation program at Mobil Research. For complete details ask your Mobil representative.

The Multi-Service Grease with unique Calcium EP Complex. Never before in a single lubricant such a wide range of use . . . such a margin of superiority . . . such a potential for maintenance savings!

Versatility unparalleled...

Mobilplex ep

A product of Mobil research . . . Mobilplex EP . . . a Multi-Service extreme-pressure grease far superior in quality and range of applications to any multi-purpose grease available.

Mobilplex EP, with a unique Calcium EP Complex, provides maximum protection against wear, rust, washout and heat. Because of its greater versatility, Mobilplex EP goes further than competitive extreme-pressure greases in simplifying your lubricant application, storage and purchasing practices. This new-type lubricant has given industrial machines greater protection while replacing as many as seven other greases. Mobilplex EP has all of the advantages usually associated with EP greases—as well as excellent storage, structural and oxidation stability.

Examination of the Socony Mobil evaluation summary at left shows that in comparison with five competitive extreme-pressure lubricants Mobilplex EP is the only grease excellent or good in every grease quality tested. No wonder aluminum and steel mills, metalworking shops, cement plants, and the chemical and rubber industries are reporting dramatic success with Mobilplex EP.

For full details contact your local Mobil representative, or write Mobil Oil Company, 150 East 42nd Street, New York 17, New York.

*Multi-Service means excellent for all types of anti-friction and plain bearings under various operating conditions up to temperatures in the range of 300 F. and for all types of dispensing equipment.

For a descriptive brochure and specific recommendations, cut out and mail on your letterhead.

Mobil Oil Company, Room 2057D

Gentlemen: Re: Mobilplex EP Grease Ad. Please have technical representative call to discuss:

- ☐ Performance results.
- ☐ A specific grease lubrication problem involving water_____ caustic_____ acid_____ heat_____.
- ☐ Reducing the number of greases in my plant.

MOBILPLEX EP
THE MULTI-SERVICE GREASE
OFFERING UNEQUALLED POTENTIAL FOR MAINTENANCE SAVINGS FOR LUBRICANT SIMPLIFICATION

Mobil

Proved Petroleum Products . . . Available with a Mobil Program of Correct Lubrication

MEET BILLY RENEAU – United Carbon district sales manager and an avid fisherman when not working.

In fishing, selecting the right bass plug is the first step in bringing in the big ones.

In our business, selecting the best raw materials is the first step in producing better black masterbatches.

THE FIRST STEP

United Carbon samples for quality testing during every phase of black masterbatch production. Here, a technician is sampling a tank car of monomer prior to approving its use.

Dialing from a central control point helps this United Carbon technician obtain necessary data to maintain quality of the monomers used in producing black masterbatches. Highly instrumented controls, such as those shown, aid in efficiently producing top-flight masterbatch products.

Carbon black, styrene and butadiene are only three of the raw materials used to produce BAYTOWN black masterbatches. However, United Carbon takes every step necessary to, first, make sure each ingredient is of the highest quality and, second, to keep it at these high standards through all production steps.

As these raw materials are received, each is tested to make certain of its high caliber before and during storage as well as just before production starts. Then, as the ingredients are combined, quality control tests are made all along the line to assure production of black masterbatches with uniformity unsurpassed in the industry.

BAYTOWN—The Birthplace of Black Masterbatch

For more information on the quality and uniformity of Baytown black masterbatch, contact:

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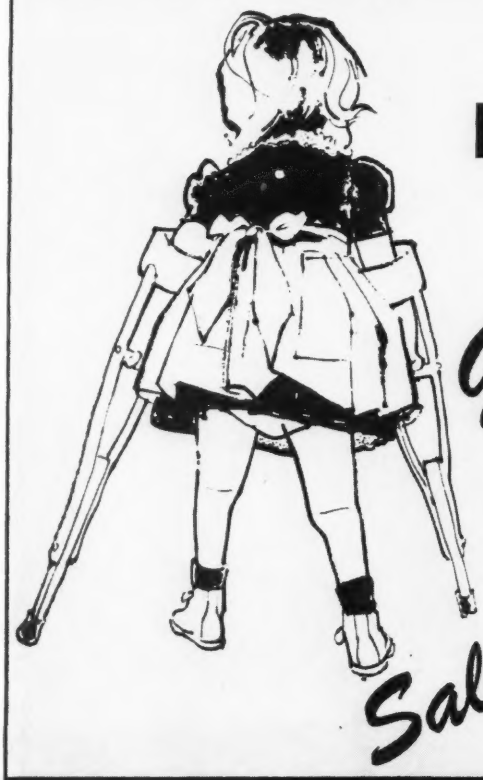

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FAST-CURING ACCELERATORS FOR NEOPRENE

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(dibutylthiourea)

PENNZONE E
(diethylthiourea)

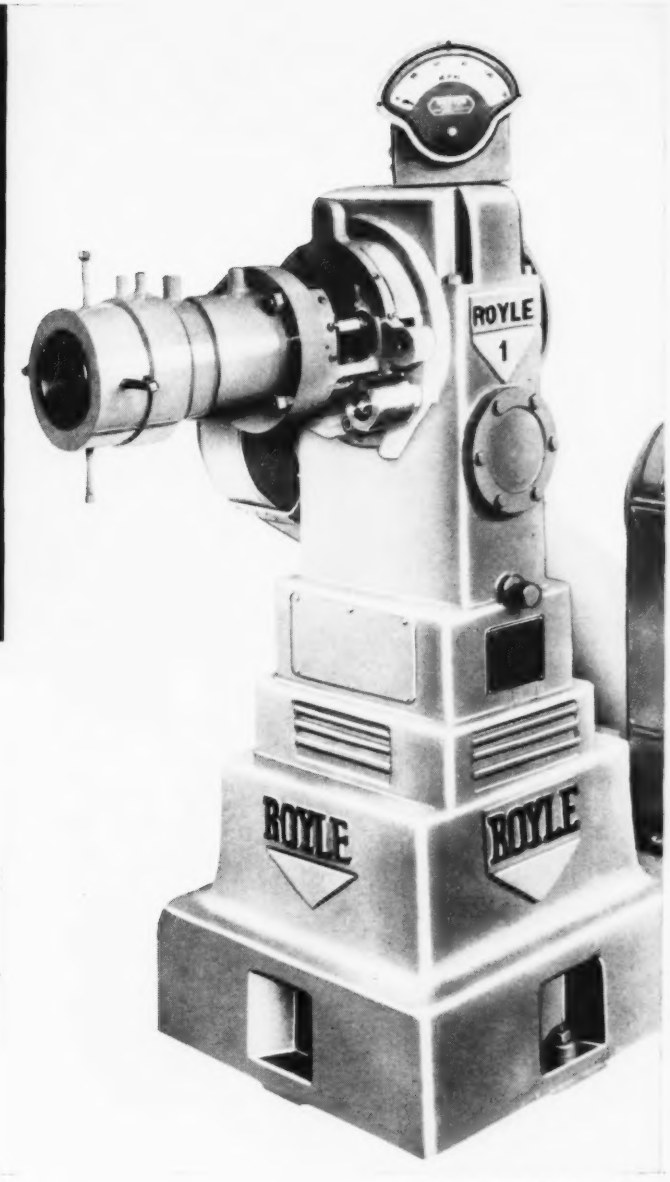

Photo Courtesy John Royle & Sons

The Pennzones* provide very fast curing Neoprene compounds. They are especially attractive accelerators for such products as CV jacket compounds, continuous cure extruded sponge, and for molded goods where either fast cures or low vulcanizing temperatures are desired. Scorch times for Pennzone-cured compounds can be extended with Thirams, DOTG or MBTS.

Ask for Pennsalt Bulletin S-167. It gives data on curing, physical properties, aging and retarding. Write Industrial Chemicals Division, PENNSALT CHEMICALS CORPORATION, Three Penn Center, Philadelphia 2, Pa.

BASE COMPOUND	
Component	PHR
Neoprene WRT	100.0
SRF Black	30.0
Pennox A*	1.0
ZnO	5.0
Extra light MgO	4.0
	140.0

	PENNZONE B 1.0 PHR				PENNZONE E 1.0 PHR			
Mooney Scorch T5 @ 248°F.	6.1				3.5			
Cure—min. @ 307°F.	M300	T	E	H	M300	T	E	H
5	1225	2900	520	55	1950	2300	350	60
10	1350	2850	490	55	2000	2500	320	60
20	1650	2850	420	55	2050	2625	320	60

*Pennzone and Pennox are trademarks of Pennsalt Chemicals Corp.

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BUTAC | NATAC | TURGUM S

Butac® improves pigment dispersions, tensile strength, resistance to tear, heat embrittlement and cut growth in SBR rubbers; improves knitting of laminated Nitrile compounds. Activates cure slightly; use 2 to 10 parts per 100 parts SBR.

Natac® inhibits bloom in natural rubber and natural rubber/SBR blends; maintains tack in calendered uncured stocks, even where abnormal temperature changes promote bloom. Neutral with thiazole and thiuram acceleration; use 3 to 4 parts per 100 parts rubber hydrocarbon.

Turgum® S plasticizes and conditions SBR; retards polymerization of polymer at mixing temperatures, and improves cured physical properties. Turgum S is a very effective retarder for high, intermediate and super abrasion furnace black/natural rubber stocks over the entire processing temperature range from 220° to 270°F. Use 5 to 15 parts per 100 parts SBR; 3 to 4 parts per 100 parts natural rubber.

	Density (Sp. Gr.)	*Softening Point (Ring & Ball)*
Butac	1.075—1.085	135—152°F.
Natac	1.075—1.085	145—155°F.
Turgum S	1.06—1.07	135—145°F.

Where you have factory processing problems,
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Carbon Blacks • Clays • Rubber Chemicals

Wise Owls read Huber Technical Literature.

These Men Need YOUR Help

There is a group of very dedicated men in the rubber industry who work hard and study hard, but are seldom given much in the way of public recognition. These are our safety engineers.

These men, working together in the Rubber Section of the Industrial Department of the National Safety Council, have as their objective the complete elimination of every accident, no matter how minor. This group has committees working on all of the various aspects of safety within the industry as well as off-the-job safety. They hold regular meetings and formal Safety Congresses to compare notes and pass along information for the good of all. This is one organization with few, if any, secrets. Information on any new device or method is readily made available to anyone desiring it.

A major problem is, of course, getting the message across to the rest of us. If a person is determined to "cross against the light" or "reach behind the guard," the safety man can hardly hope to prevent the accident. Any safety guard, switch, glasses, shoes, or plan which is unused or bypassed not only creates an unsafe condition, but indicates a sloppy attitude toward safety which needs correction at once.

These men need, and should get, 100% backing. First of all, from top management to lead the way in thinking and in policy and operating directives. Next, from all those in supervisory positions for education, instruction, and direction. And last, but not least, from every individual involved to make the program completely effective.

Each one of us should, therefore, stop right now and give serious thought to our own position in terms of safety. We should keep safety in mind always, but we should also make it a point to reevaluate periodically what we can do to make our safety program more effective.

If your company is now represented in the Rubber Section, be sure it is an active representation and take advantage of all the help the Section offers. If your company is not yet represented, it would seem very desirable to investigate the matter right now. RUBBER WORLD will be very happy to send you the name of a Membership Committeeman in your area.

R. S. Walker

EDITOR

ULTRA ACCELERATION

When it's speed you need, compound with these Vanderbilt dithiocarbamate ultras

TELLURAC® fastest known accelerator for Butyl rubber vulacanization

BISMATE® recommended for rapid, high temperature curing of natural, stereo and copolymer rubbers

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Vanstay® RZ-25

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For Safer Mixing

The Lunn-Type Safety Bar

Moving the safety bar down to waist level helps keep operator out of danger and permits stopping mill even if both hands are caught

AN ACCIDENT on a rubber mixing mill, while it does not happen too often, thank goodness, is usually a very serious matter both to the individual and to his company. Preventing such accidents has been of prime concern to safety engineers and managers for many, many years. A guard which would positively prevent a man from approaching the danger area with any part of his body would be the ideal solution. Since no suitable guard that would not interfere with operation has yet been devised for mills actually used for hand mixing, most consideration has been directed toward improved safety bars or physical arrangements which keep the worker at a sufficient distance as to make it difficult for him to reach over the mill roll.

One improvement has been the relocation of the safety bar. Instead of the traditional position overhead, the bar is positioned at waist level so that the operator will contact it with his body rather than have to depend on reaching the high bar with a hand. If both hands get caught, obviously the man will have little chance to shut the machine off without help from a coworker.

Had Early Start

This principle has been given the title of Lunn Safety Bar after R. W. Lunn, of Leyland & Birmingham Rubber Co., Ltd., who discussed in *India-Rubber Journal* (July 11, 1953) this type of sensitive safety bar and positioning so that a person could work safely. Bars of this type had, however, been devised and installed in plants as early as 1930 so that the actual origin of the idea cannot be pinpointed. The Dunlop Tire & Rubber Corp. plant at Buffalo, N. Y., has prints on file of a bar such as that shown in Figure 1 which go back to 1935.

The greatest interest and impetus for adoption of this system have occurred in England. In 1952, a year prior to Mr. Lunn's presentation, The National Joint Industrial Council for the Rubber Manufacturing Industry in England prepared written standard specifications for a sensitive safety bar and then later agreed that after March 31, 1953, all quotations for new mills would include provision for the Lunn Bar and that all new mills would be so equipped after December 31, 1953. Since 1955 all European mills both old and new have been equipped with this device.

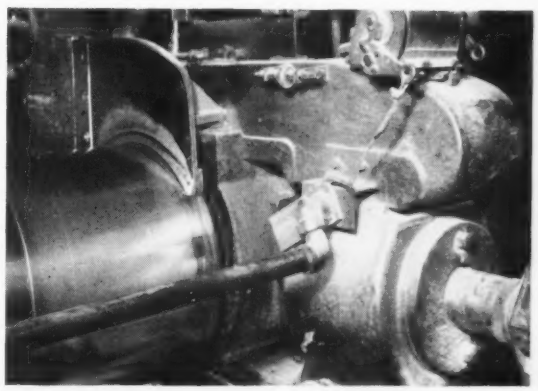


Fig. 1. Dunlop-type sensitive safety bar. Slight movement of the bar will stop mill. Switch must be reset to restart the mill

In spite of the fact that Dunlop's Buffalo plant has used this type of bar since before 1930, according to Chief Engineer C. S. McChesney, United States companies have shown little inclination to install them. There have been, however, other methods tried to help meet the problem of mill safety. For example, Firestone's manager of safety, M. R. Batche, reports that all Firestone mills are equipped with "belly bars" which, while they do not shut off the mill, do tend to keep the operator's reach from extending into the danger area.

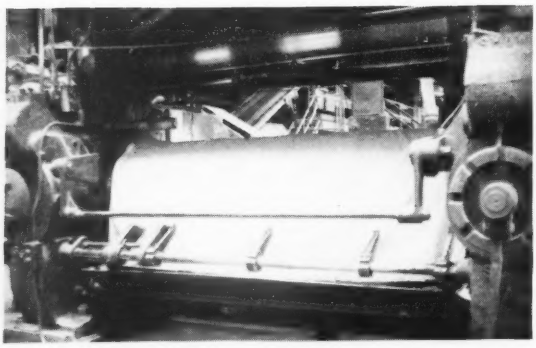


Fig. 2. Original equipment bar as furnished on Shaw mills

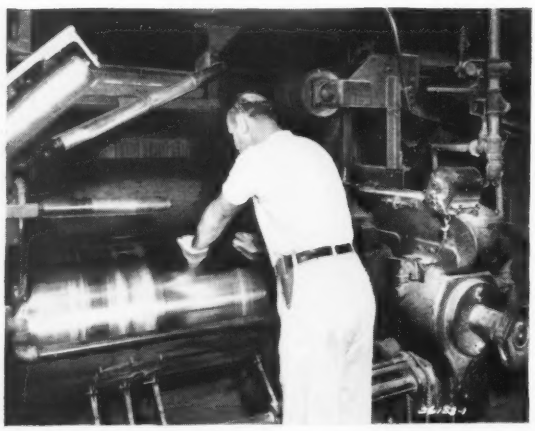


Fig. 3. Position of mill man to actuate safety bar

Fig. 4. Ability of operator to work with bar in place is illustrated

Canadian Interest Growing

In Canada the past year or so has seen considerable gain in the use of the Lunn Safety Bar. Chief Security Officer Ed Turner, of the Goodyear company in Canada, reports as follows:

"It was some two years ago that the Canadian companies began to take a realistic look at the high cost of mill injuries and decided to do something about it. By now sufficient experience on all types of mills both open and encumbered had been gained by the European plants, and no obstacle could be foreseen to prevent one or two installations being made in Canada."

Dunlop of Canada, Ltd., Whitby, Ont., made the first active move, perhaps spurred on by an engineer transferred from Buffalo, and is given credit for the experimental work which was carried out and has since lead to successive installations by other Canadian companies.

Mr. Turner further reports, "As of January, 1961, Dunlop has about 75% of their mills so guarded, and Goodyear, New Toronto, plans to have the rest of their mills so modified within the year. When Goodyear started the new plant in Alberta in 1960, all mills had Lunn Bars, making it easy to train the new workers with the pressure-sensitive bars in front of them."

Interest in Canada is sufficiently high for Francis Shaw (Canada), Ltd., to furnish a sensitive safety bar as original equipment on new mills it manufactures. The Shaw bar is shown in Figure 2. Most of the bars being used were installed by the rubber manufacturers on existing mills.

Also in response to this interest, the Dominion Engineering Co., Ltd., another manufacturer of mills, started to make plans early in this year to offer the Lunn safety principle on its mills.

Goodrich, Dominion, General, Firestone, and Mansfield plants in Ontario are in the process of installing prototypes on their first mills to gain experience. Plans are being made to install these bars 100% in new plant operations.

As can be seen in Figure 3, the mill man has activated the safety bar even though his hands are still not over the crown of the mill roll. Since men come in assorted sizes, however, no mill is safe unless the men who work on it fit between the limits of safety accommodations provided by that mill. An extra-tall man with a long reach could get into the danger zone with his hands without tripping the safety. While he would undoubtedly then trip the bar, the accident would have happened, and the goal of safety men everywhere is to prevent the accident, not just stop the machine after an accident has occurred.

Many critics of the low bar claim that it would interfere with efficient operation, particularly where there are encumbrances. Adjustment of knife holders is shown in Figure 4, which illustrates little in the way of extra difficulty for the man doing the job. Plants installing the system report no efficiency problems except for the operator resistance in the immediate period after the bars have been put on.

No Standard Design

The variation in design still employing the basic idea can be seen in Figure 5. In this Goodyear Canada design the counterweight is higher on the mill frame, with the cut-off switch above it. The stopping distance per-

mitted when the switch is actuated is 2% of the travel at operating speed of drive roll as measured on the surface in feet per minute.

Specifications

The specifications for the Lunn-type sensitive safety bar, as taken from "Report of the No. 1 Mill Committee under the National Joint Industrial Council for the Rubber Manufacturing Industry, Manchester, England, July, 1953," are as follows:

1. Consist of a horizontal rigid bar, permanently secured at each end to suspension arms. Each suspension arm will be carried in ball or roller bearings.

2. The sensitive bar will be loaded by weights permanently secured to give a total horizontal loading to the bar of about 40 pounds. The construction of bar suspension arms and weights will be such as to eliminate any possibility of relative movement between parts.

3. Movement of not more than ½-inch of the sensitive bar will cause the operating switch or switches to cut off power from the driving motor and simultaneously apply the brake. The switches will be rigidly secured and located on the mill frame. Stops will be provided to limit movement of the sensitive bar in either direction. The position of the bar relative to the fixed guard will be such as to prevent as far as possible material or hands, etc., entering the space between the bar and the fixed guard so as to interfere with the bar movement. Switches and strikers will be protected against possible damage or interference by stock in the machine.

4. A fixed and rigid guard will extend from the sensitive safety bar to the machine tray or its equivalent which will,

(**a**) prevent access under the bar, and

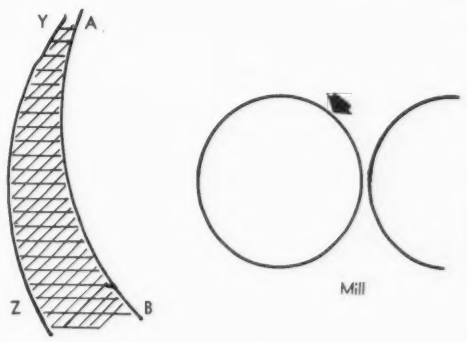
(**b**) prevent foothold above the working level.

5. Suitable fairings on the machine bedplate will be provided if necessary for the purpose of preventing foothold above the intended standing position of the operator.

6. The safety limit for both front and back rolls will be indicated clearly by arrows, engraved or permanently secured in position.

7. The machine will carry a plate with the wording, "This mill is not safe for operatives who can reach beyond the safety limit. The arrow indicates the safety limit."

Although safety engineers in the U. S. are not convinced that this type of bar is the ultimate in making mills safe, they have given it considerable thought. At the meeting of the Rubber Section, Industrial Department, National Safety Council, held in New York in January, a motion picture of the Lunn Safety Bar in action was shown. Many viewers indicated that they felt there were many mills which might not need this type of protection or, because of auxiliary equipment, could not be so fitted. They did agree, however, that the adoption of the Lunn principle where open mill mixing is employed might be desirable.



Mill Safe Working Zone

In order to determine the proper position for a Lunn-type sensitive safety bar, a mill safe-working zone has been set up. This zone, cross-hatched area in the accompanying illustration, is the working area between a maximum reach from the safety point, arrow, and a normal reach from the mill roll surface. It is assumed that the maximum reach to be accommodated is 42 inches. The curve AB is thus drawn at a 42-inch radius from the safety point. The arm is assumed to be bent around the roll like a piece of rope. If the point of restraint, the sensitive safety bar, is set outside this curve away from the roll, then the man cannot reach beyond the safety limit without touching the bar and stopping the mill. A man with a shorter reach will set off the safety switch before the safety limit is reached.

The curve YZ is drawn at a distance of 32 inches from the roll surface and concentric with it. This is considered a man's normal reach and will permit him to touch the roll surface with his finger tips with his arm extended normally. At any point on or within curve YZ a man with a 32-inch or longer reach can work the mill.

Beyond curve AB, therefore, conditions are safe, and within YZ a man may work. Between the two, then, is a safe and possible working zone.

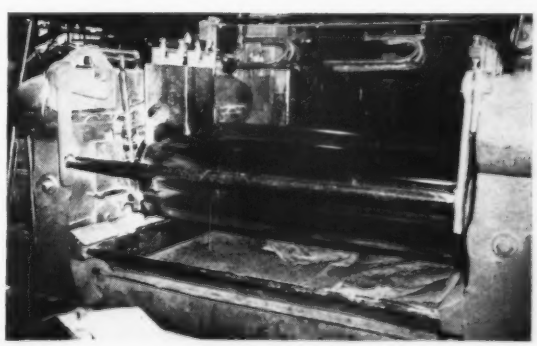


Fig. 5. Lunn-type safety bar used by Goodyear Canada

Oxides' Effect on Rubber Plasticity

Zinc oxide is an effective plasticizer for natural rubber, but not for cold SBR, butyl, or nitrile rubber. Lime or magnesia stiffens natural rubber and cold SBR, and magnesia stiffens nitrile rubber

By C. A. CARLTON

J. M. Huber Corp., Borger, Tex.

IN A previous paper,[1] "One Cause of Poor Pigment Dispersion in Rubber," the best conditions for obtaining proper dispersion of litharge, hydrated lime, magnesia, or zinc oxide, when added with various acidic materials to natural or synthetic rubbers, were investigated. In connection with this dispersion work it was noted that zinc oxide and litharge each exerted a plasticizing action on natural rubber; while hydrated lime and magnesia each stiffened this type of rubber.

The further investigations reported in this second paper are concerned with the effect on the plasticity of NR of litharge, lime, magnesia, or zinc oxide added with various fatty acids, and of zinc oxide, lime, or magnesia or several representative chemical plasticizers when mixed with NR in the absence of other ingredients. Also investigated was the effect of zinc oxide, lime, or magnesia on the plasticity of SBR, butyl, or nitrile rubbers when mixed under these latter conditions.

Either zinc oxide or litharge was shown to be an effective plasticizer for NR. Zinc oxide, when mixed with NR in the absence of other ingredients, has its maximum plasticizing effect in amounts between 0.75 and 3.0 phr. in the original mix. Under these conditions it is somewhat more effective than five of seven of the chemical plasticizers tested. The chemical plasticizers, however, generate less heat during mixing than zinc oxide.

Zinc oxide has no measurable effect on the plasticity or amount of heat generated during mixing alone with SBR, butyl, or nitrile rubbers.

Both lime and magnesia stiffen NR, SBR 1500 and 1502, but neither of these inorganic oxides has any substantial effect on the plasticity of SBR 1778. Lime or magnesia each has a slight softening effect on butyl rubber during remixing. Magnesia stiffens nitrile rubber.

Both lime and magnesia increase the amount of heat generated during mixing with SBR, butyl, or nitrile rubbers.

Effect on NR of Inorganic Oxides with Fatty Acids

Lime, litharge, magnesia, or zinc oxide was added together with each of several fatty acids in accordance with the high-temperature Banbury mixing procedure used in the previous paper. The batches used were made up of 900 grams of premasticated pale crepe, 45 grams of inorganic oxide, and 18 grams of fatty acid, which correspond to a recipe of 100 parts of rubber, 5 phr. of oxide, and 2 phr. of fatty acid.

HIGH-TEMPERATURE BANBURY MIXING PROCEDURE

Cycle Time, Min.	Rotor Speed No.	Cooling Water, 48° F., Gals./Min.	Procedure
0	1 (front, 80 rpm. back, 71 rpm.)	1	Add rubber
2	1	1	Add basic and acidic materials
As indicated	3 (front, 160 rpm. back, 142 rpm.)	None	Dump at 325° F.

The data reported in Table 1 show that both lime and magnesia exert a definite stiffening effect on the mixes with Williams plasticity values[2] ranging from 1.31 to 1.46 for lime and 1.28 to 1.43 for magnesia; while the softening action of litharge is shown by plasticity values that range from 0.66 to 0.78, and of zinc oxide by values from 0.53 to 0.61. The mix containing only rubber and stearic acid gave a plasticity value of 0.93.

The recovery values are of particular interest in that lime and magnesia gave values in the range of 0.16 to 0.42; while litharge and zinc oxide gave very low values from zero to 0.03.

Both lime and magnesia generate more heat during mixing than does litharge or zinc oxide; each of the former reach a temperature of 325° F. in 6½ minutes; whereas the mixes containing litharge leveled off between 315 and 324° F., and those containing zinc oxide between 305 and 309° F., both after 8½ minutes of mixing.

Oxides Compared with Chemical Plasticizers in Natural Rubber

In order to investigate further the plasticizing action of zinc oxide on NR, various concentrations of zinc oxide were compared with lime and magnesia at 5 phr. and with various chemical plasticizers at 0.2 phr. These mixes did not contain a fatty acid.

The mixing conditions used were as follows: labora-

[1] RUBBER WORLD, Mar., 1961, p. 59.

[2] ASTM D 926-56, American Society for Testing Materials, Philadelphia 3, Pa.

TABLE 1. EFFECT OF INORGANIC OXIDES WITH FATTY ACIDS ON NATURAL RUBBER

Inorganic Oxide	Fatty Acid	Banbury Temp., °F.	Dump Time, Min.	Plasticity & Recovery*
None	Stearic†	315	8.5	0.93–0.04
Lime	Lauric	325	6.5	1.31–0.17
	Oleic	325	6.5	1.36–0.16
	Palmitic	325	6.5	1.43–0.23
	Stearic	325	6.5	1.41–0.30
	Stearic†	325	6.5	1.46–0.23
Litharge	Lauric	315	8.5	0.66–0.03
	Oleic	316	8.5	0.71–0.02
	Palmitic	320	8.5	0.72–0.01
	Stearic	324	8.5	0.78–0.01
	Stearic†	322	8.5	0.75–0.00
Magnesia (Maglite D)	Lauric	325	6.5	1.43–0.42
	Oleic	325	6.0	1.39–0.33
	Palmitic	325	6.5	1.28–0.16
	Stearic	325	6.0	1.31–0.32
	Stearic†	325	6.5	1.35–0.23
Zinc oxide	Lauric	307	8.5	0.54–0.01
	Oleic	309	8.5	0.59–0.00
	Palmitic	307	8.5	0.53–0.03
	Stearic	305	8.5	0.59–0.00
	Stearic†	308	8.5	0.61–0.00

*Williams plasticity after 4 min. @ 212° F.; one min. recovery. Data expressed in tenths of inches.
†Double pressed.

The Banbury dump temperature, Mooney viscosity,[3] and the Williams plasticity and recovery data for these mixes are given in Table 2. On the original mix, the maximum plasticizing effect obtained with zinc oxide, as measured by both Mooney viscosity and Williams plasticity, is evidenced at 0.75 to 3.0 phr. After remixing, 0.50 to 0.75 phr. of zinc oxide gave the lowest Mooney viscosity values; while the lowest Williams plasticity values appeared at 3 to 5 phr.

As measured by Mooney viscosity values, two of the chemical plasticizers were more effective than zinc oxide with the original mix; while Williams plasticity values showed all but one of the chemical plasticizers to be somewhat more effective than zinc oxide.

The Mooney viscosity data indicate that two of the chemical plasticizers were more effective than zinc oxide after remixing, with the others being substantially equal to zinc oxide in their plasticizing effect. The Williams plasticity data show three of the chemical plasticizers to be more effective than zinc oxide after remixing. In addition, the use of chemical plasticizers results in less heat generation during mixing than with zinc oxide.

The use of either lime or magnesia stiffens the rubber, increases the Williams recovery values materially, and produces more heat during mixing than the use of zinc oxide or the chemical plasticizers.

TABLE 2. EFFECT OF ZINC OXIDE, LIME, MAGNESIA, AND CHEMICAL PLASTICIZERS ON NATURAL RUBBER

Material	phr.	Dump Temp., °F.		Mooney Viscosity*		Plasticity & Recovery†	
		1st Mix	Remix	1st Mix	Remix	1st Mix	Remix
None	—	316	296	64	50	1.10–0.05	0.95–0.04
Zinc oxide	.25	318	295	61	38	1.08–0.05	0.84–0.00
Zinc oxide	.50	318	284	51	28	0.93–0.02	0.68–0.00
Zinc oxide	.75	314	281	47	28	0.85–0.01	0.67–0.00
Zinc oxide	1.00	312	281	48	29	0.85–0.00	0.66–0.00
Zinc oxide	3.00	311	278	47	29	0.85–0.01	0.64–0.04
Zinc oxide	5.00	312	280	51	30	0.91–0.03	0.64–0.04
Lime, hydrated	5.00	331	300	70	55	1.26–0.12	1.11–0.06
Magnesia, (Maglite D)	5.00	333	307	75	52	1.41–0.22	1.06–0.08
Endor	.20	300	260	50	28	0.86–0.06	0.71–0.02
Pepton 22	.20	290	263	49	28	0.70–0.05	0.69–0.02
Pepton 65	.20	285	260	50	28	0.66–0.04	0.66–0.03
PC-640	.20	291	263	48	27	0.70–0.04	0.63–0.03
RPA-2	.20	290	262	49	27	0.70–0.03	0.67–0.02
RPA-3, Conc	.20	290	258	45	21	0.66–0.03	0.58–0.01
RPA-6	.20	290	253	44	20	0.68–0.02	0.58–0.01

*ML—4, 212° F. Viscosity rubber used—95.
†Williams plasticity, 4 min. @ 212° F.; recovery after one min. Plasticity and recovery of rubber used, 2.05—.84.

tory-size B Banbury; batch size, 1000 ml.; speed No. 3; ram pressure, 30 psi.; cooling water, one gallon per minute at 48° F.; starting temperature, 125° F. The inorganic oxide or chemical plasticizer was added after the rubber had been masticated for one-half a minute; the mixing was continued for five minutes and then dumped. The batch was mixed again for five minutes, 24 hours after the original mix, using the same conditions as for the first mix.

[3]ASTM D 1646-59T.

Effect of ZnO on Synthetic Rubbers

The effect of zinc oxide on the plasticity of both cold and cold oil-extended SBR, butyl rubber (Enjay Butyl 268), and nitrile rubber (Chemigum N600) was determined by mixing 1, 3, and 5 phr. of zinc oxide with these rubbers under the same conditions and procedure used to obtain the data reported in Table 2.

It appears that zinc oxide has no measurable effect on the resulting plasticity or the amount of heat gen-

TABLE 3. EFFECT OF ZINC OXIDE ON SOME SYNTHETIC RUBBERS

Rubbers	ZnO, phr.	Dump Temp., °F.		Mooney Vis.,* ML-4, 212 °F.		Williams Plasticity†	
		1st Mix	Remix	1st Mix	Remix	1st Mix	Remix
Enjay Butyl 268	0	266	264	73	74	1.05–0.07	1.10–0.11
	1	265	264	70	70	1.10–0.06	1.05–0.13
	3	265	266	70	67	1.05–0.06	1.06–0.09
	5	268	267	70	67	1.02–0.04	1.08–0.08
Chemigum N600	0	325	310	47	39	1.06–0.15	0.99–0.16
	1	323	310	46	40	1.02–0.13	0.95–0.17
	3	323	312	46	40	1.03–0.15	0.94–0.16
	5	323	310	46	40	1.08–0.18	0.98–0.16
SBR 1500	0	327	310	47	42	1.03–0.14	1.01–0.13
	1	325	317	47	43	1.01–0.11	1.01–0.18
	3	327	317	47	42	1.06–0.11	0.96–0.14
	5	326	320	48	43	1.06–0.15	0.98–0.16
SBR 1502	0	315	295	39	32	0.91–0.08	0.80–0.10
	1	317	295	39	33	0.92–0.10	0.84–0.09
	3	317	297	39	33	0.92–0.09	0.82–0.10
	5	318	297	39	33	0.96–0.08	0.86–0.10
SBR 1778	0	285	275	48	41	1.17–0.33	1.06–0.05
	1	284	274	48	42	1.18–0.43	1.06–0.19
	3	283	276	48	42	1.15–0.40	1.09–0.21
	5	283	276	48	41	1.15–0.27	1.08–0.24

*Mooney viscosity of rubbers as received: Enjay Butyl 268, (71); Chemigum N600, (54); SBR 1500, (52); SBR 1502, (51); SBR 1778, (55).

† Plast., 4 min. @ 212° F.; recovery after one min. Plast. & recovery of rubbers as received: Enjay Butyl 268, (1.17-0.02); Chemigum N600, (1.19-0.23); SBR 1500, (1.07-0.08); SBR 1502, (0.99-0.04); SBR 1778, (0.99-0.04).

TABLE 4. EFFECT OF LIME AND MAGNESIA ON SOME SYNTHETIC RUBBERS

Rubbers	Additive	Dump Temp., °F.		Plasticity & Recovery*		
		1st Mix	Remix	As Rec'd	1st Mix	Remix
SBR 1500	None	327	310	1.07–0.08	1.03–0.08	1.03–0.13
	Lime	328	347	—	1.50–0.17	1.38–0.59
	Magnesia	345	336	—	1.29–0.16	1.23–0.23
SBR 1502	None	315	295	0.99–0.04	0.91–0.08	0.80–0.10
	Lime	324	325	—	0.98–0.08	1.21–0.22
	Magnesia	332	320	—	0.96–0.06	0.85–0.05
SBR 1778	None	285	275	0.99–0.04	1.17–0.33	1.06–0.05
	Lime	283	278	—	1.15–0.11	0.98–0.07
	Magnesia	295	290	—	1.22–0.21	1.09–0.08
Enjay Butyl 268	None	266	264	1.17–0.02	1.05–0.07	1.10–0.11
	Lime	281	274	—	1.09–0.06	0.98–0.05
	Magnesia	282	276	—	1.00–0.03	0.95–0.03
Chemigum N600	None	325	310	1.19–0.23	1.06–0.15	0.99–0.16
	Lime	331	321	—	1.05–0.12	1.00–0.10
	Magnesia	333	325	—	1.19–0.17	1.05–0.11

*Williams plasticity, 4 min., 212° F.; recovery after one min.

erated during mixing for any of the five samples of synthetic rubber tested (Table 3).

Effect of CaO and MgO on Synthetic Rubbers

The effect of lime and magnesia on the plasticity of both cold and cold oil-extended SBR, butyl, and nitrile rubbers was also determined by mixing 5 phr. of each of these inorganic oxides with samples of these rubbers under the same conditions and procedure used for the results reported in Table 2.

Both lime and magnesia stiffen SBR 1500 and 1502, but are substantially neutral in their effect on the plasticity of SBR 1778, the oil-extended rubber (Table 4). With the grade of butyl rubber used, both lime and magnesia had a slight softening effect, particularly with the remix. The nitrile rubber used was stiffened slightly by magnesia.

Both lime and magnesia increased the amount of

(*Continued on page 78*)

Rapid Mechanical Deflashing

New machine can process in minutes, with usually superior results, a box full of parts which previously required buffing, tearing, knife or scissor trim

FAST, economical, and efficient deflashing of rubber parts which would normally require long tedious hand-finishing is now possible by using a new mechanical deflasher introduced by Wheelabrator Corp. This machine is the result of a development program to adapt the successful principle of impact deflashing long used in the foundry industry, which has proved very satisfactory in removing molding flash from thermosetting plastic parts. The major problem to be solved was to make the resilient rubber flash rigid enough to break away under the impact of the shot media. This is accomplished by precisely controlled freezing.

Many precision, semi-precision, or intricate molded parts made by transfer, injection, and flashless molding as well as in many conventional compression molds result in parts with very thin or fine wisps of flash. This flash must be removed by hand in most cases, using knives, scissors, buffers, or trimming in the mold before removing the parts. Even those parts which can be kick or power pressed to die cut or tumbled in freeze or dry barrels often are not too satisfactorily or cleanly trimmed. The mechanical deflasher will process a large number of parts and within a short (five to seven minutes) cycle completely remove this flash without damage to the part itself.

This Wheelabrator Impact Mechanical Deflashing Process (patent approved) can conceivably be applied to any molded rubber product, but for the present it is most readily adapted to parts with controlled flash that does not exceed 0.005-inch at the point where it is attached to the part. The process is capable of deflashing parts with very thin sections, so long as the flash meets the 0.005-inch or less requirement, and the part wall thickness is at least 0.015-inch or thicker. Products molded from stocks based on all the organic rubbers and some silicones have been trimmed. Certain low-temperature silicone rubbers do not lend themselves to the process, but further work is under way to increase the process' adaptability to a larger variety of silicone compounds.

Four Machines Operating

Four of these machines (see Figure 1) have been built and are in operation. One is in the Wheelabrator demonstration laboratory. The first one put into actual production use was purchased by Victor Mfg. & Gasket Co. in the Summer of 1960. Victor had provided sample parts and technical advice in the final design stages of perfecting the deflasher. Since that time Acadia Synthetic Products Division, Western Felt Works, and Goshen Rubber Co., Inc., have also installed these units.

In addition, Parker Seal Co., Division of Parker-Hannifin Corp., and Minnesota Rubber Co. will soon install units which are now on order.

The Victor machine was purchased as part of an overall program that also included mold improvement and a new standards and incentive system. The company has indicated that the production economy presently being achieved justifies the effort expended in ironing out some of the "bugs" in perfecting this first Wheelabrator Mechanical Deflasher built. Victor is using this machine to deflash its line of gaskets and seals including molded rubber shaft seals with metal inserts. Most of these seals were formerly hand torn to remove flash immediately after molding. The skiving process required to insure a precision internal sealing lip is still necessary, however, after mechanical deflashing.

The Acadia unit, installed in August, 1960, is currently operating one shift a day and has replaced 10

Fig. 1. General view of the Wheelabrator Impact Mechanical Deflashing Machine. This installation includes the optional air-operated bucket loader (just about to load machine) and a discharge conveyor which was added separately by the owner, Acadia Synthetic Products, Western Felt Works

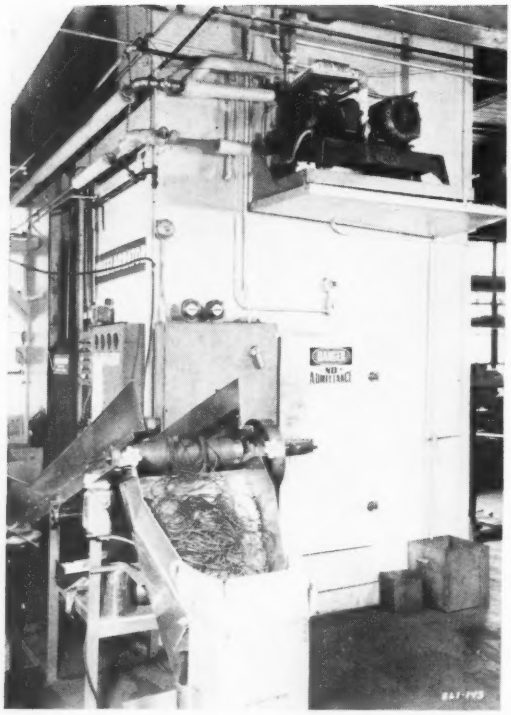


Fig. 2. Completely deflashed O-rings coming off discharge conveyor after mechanical processing

workers who formerly hand-finished O-rings and other molded products. About 60% of Acadia's molded products are mechanically deflashed, with exceptions being such products as skived or silicone parts. A company spokesman reports a vast reduction in direct labor required for deflashing molded products, particularly O-rings. As an example, manhours required for finishing 2 inches to 16 inches I.D. O-rings with sectional diameters less than ¼-inch have been reduced 87-97%. Finishing manhours on slightly larger-section rings have been reduced 67-90%, and on other irregular parts reductions of 30-86% have been made, with average savings of about 60%.

Cost items such as CO_2, media, depreciation, power, and maintenance must be balanced against these labor savings, but are reported to be minor. The CO_2 represents the largest single cost, but gas consumption can be controlled so that it is considerably less than for the same parts finished with conventional CO_2 tumbling.

Acadia processes O-rings up to 24 inches in diameter without damage such as overbuffing or clipping, without breakage, and with a finish at least equal to and generally superior to anything it previously obtained. Some of these rings may be seen coming off Acadia's discharge conveyor in Figure 2.

The third production machine is now handling the vast majority of molded parts at Goshen. Parts formerly CO_2 tumbled, buffed, knife-trimmed, or otherwise hand-finished are included. Goshen has reduced CO_2 tumbling from three shifts to one and substantially reduced other hand-labor. Overall direct labor requirements in the finishing department have been reduced 20%.

Goshen has also found it beneficial to collect trimming efficiency data on a given compound for this system and use this information in the design of molds to meet the process tolerances of mechanical deflashing.

Both Acadia and Goshen find the machine a valuable quality-control tool. The clean trim allows parts from worn or damaged mold cavities to be readily recognized during inspection so that corrective action can be taken.

Major Finishing Improvement

A Goshen spokesman said, "This deflashing process offers the first major improvement in decades in finishing precision molded products. It comes at an opportune time to coincide with recent developments in molding, compounding, et cetera, and will play a vital

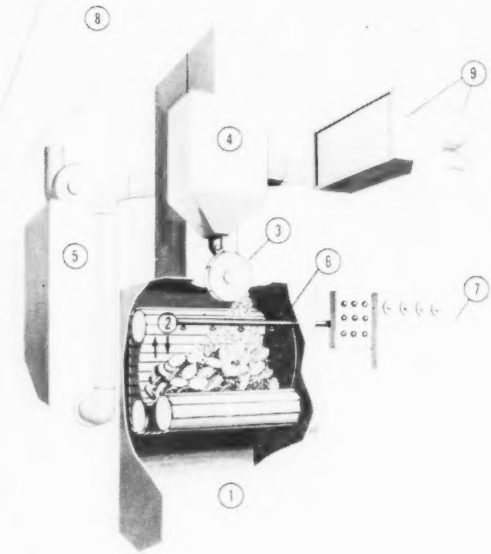


Fig. 3. Cutaway sketch of rubber deflashing machine. The major components are: (1) deflashing chamber of two-cubic-foot capacity; (2) slow-moving endless conveyor for exposing parts to freezing and deflashing blasts (parts unloaded by reversing conveyor); (3) Wheelabrator unit throws controlled pattern of media at parts; (4) media cycling and cleaning system; (5) closed-cycle dust collecting and ventilation system; (6) automatic time-temperature controlled CO_2 system for freezing of flash (7) operating panel containing sequencing timers, push-buttons, and switches for manual or automatic control; (8) insulated and vapor-sealed enclosure; and (9) auxiliary refrigeration system with automatic defrosting for cooling and dehumidifying the interior of the enclosure

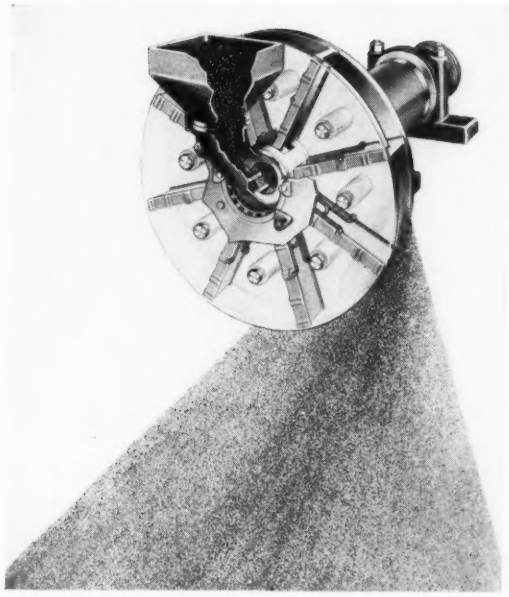


Fig. 4. Media hurling device which throws controlled pattern across working chamber to fracture and completely remove frozen flash

role in the future of the molded rubber goods industry."

Machine Features

Essentially the process consists of introducing parts into the two-cubic-foot work chamber of the machine which is completely enclosed within an insulated cabinet. While in this chamber, liquid CO_2 is sprayed through nozzles to freeze the flash on the parts (but does not freeze the parts themselves). Next, media particles are hurled by centrifugal force against the parts, fracturing and removing the frozen flash without damage to the soft unfrozen part.

Major components of the machine are shown in Figure 3. The parts are loaded through double doors on to the slow-moving endless conveyor. This conveyor gently tumbles the parts, thus exposing all surfaces to the freeze blast of CO_2 gas for a period of 20 to 30 seconds. (All times given are typical for parts used during demonstrations. Actual cycle for a specific part must be individually determined.) The Wheelabrator unit is then activated and throws a controlled pattern of media (steel shot) at parts to be deflashed. The media cycle is in the range of 3-4 minutes. During the media blast, automatic controls may be set to add short CO_2 gas blasts to insure continued freezing of the flash until the cycle is complete. The conveyor is then allowed to continue to operate for a short period (about one minute) to insure that all the media falls through to the bottom of the machine. The operator will then reverse the conveyor in order to unload the parts.

The media used is collected at the bottom of the machine and returned to the storage hopper above by a belt-and bucket-type elevator. During this recycle the media is screened and air-washed to remove fine flash particles, dust, or other impurities. These materials are collected by the integral closed-cycle dust collecting and ventilation system and gravity spouted to a container outside the enclosure.

An auxiliary refrigeration system is provided to keep the enclosure at a constant temperature of approximately 0 to —10° F. This reduces the quantity of CO_2 gas required and dehumidifies the internal atmosphere to eliminate problems of condensation and freezing of moisture.

The enclosure, about 8 by 12 feet floor area and 14 feet high, is equipped with an air-operated door for loading and a separate walk-in door for access to the interior. Ample clearances are provided within the cabinet for any necessary service work. The enclosure is well insulated and vapor sealed.

The liquid CO_2 enters a minifold under 250-300 psi. It then passes through four nozzles, vaporizing and freezing the flash on the parts within a short time. The flow is solenoid regulated and actuated by an adjustable timer which controls the cycle in seconds. Gas consumption will generally be less than 13 pounds per load of typical parts. Excessive CO_2 will not damage many heavier parts, but for economical operation and the prevention of breakage of delicate parts the flow

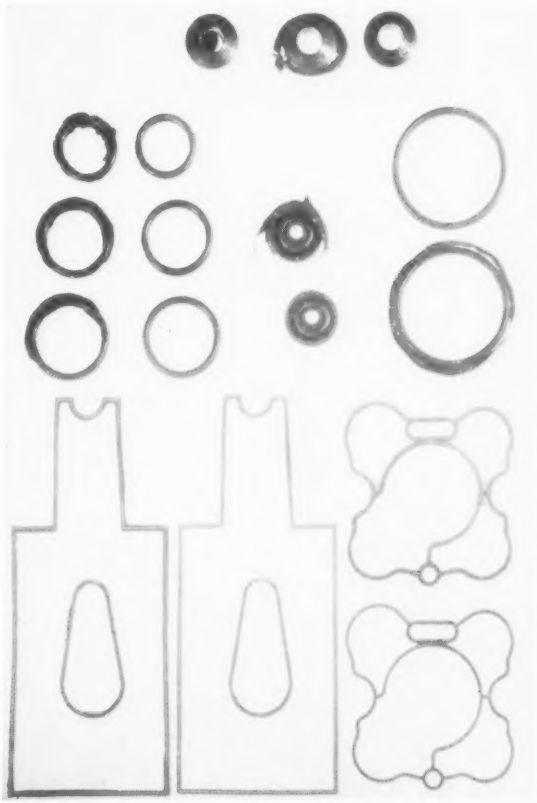


Fig. 5. Typical parts which may be deflashed by impact mechanical deflashing with great savings in time and hand-labor previously necessary on such parts

is kept to a minimum which freezes the flash while the parts remain soft.

Heart of the system is the Wheelabrator media hurling unit (Figure 4). Media from the storage hopper is fed into the center where an impeller (acting like a centrifugal pump) passes it through a control cage opening. The media is then picked up by one of the eight blades on the wheel and slides along the blade until it leaves the tip with sufficient velocity to fracture flash upon impact. The position of the control cage opening determines the point at which the particles will leave the wheel and hence controls the direction of the barrage and provides a controlled pattern across the deflashing chamber.

An optional variable-speed drive on the media hurling device permits operation up to 3,000 rpm. to control velocity of media impact, thus providing additional flexibility to the process.

Media particles are selected spherical steel pellets of 0.007- to 0.017-inch diameter with a nominal size of 0.011-inch. The barrage consists of 20 million particles a second (350 pounds per minute), and for practical purposes the deflashing occurs as soon as a part with frozen flash is exposed to this barrage.

Besides the liquid CO_2 supply, services required are water, compressed air, electricity, and a separate CO_2 gas line. Cooling water is used for the auxiliary refrigeration; the compressed air for external controls, door operation, and the optional loading device; electricity for standard use in motors, lights, and controls; and the CO_2 gas (which is taken from a separate discharge point at the top of the CO_2 storage tank) to supply a completely dry pressure source to all internal devices, thus eliminating any freezing moisture problems.

Control Is Automatic

While the machine is equipped for complete manual control, normal operation would be fully automatic with each phase of the cycle preset on the control panel from information determined during initial trials of the specific part. Loading and unloading are the only operations manually directed by the operator.

It would certainly seem that in this new machine, completely new in innovation and design as far as deflashing molded rubber parts is concerned, the possibilities for labor saving, for improved efficiency in time and handling, and for improved quality are offered. When coupled with properly designed molds, suitably compounded stocks, and other improvements in layouts and handling, this new tool could appreciably aid in reducing costs on products in this highly competitive field — a field competitive within itself, but also constantly threatened by parts made of other materials.

Wide Crusade for Use of Auto Seat Belts Launched

A "Women's Crusade for Seat Belts" was launched on April 14 by the General Federation of Women's Clubs with cosponsorship by the Auto Industries Highway Safety Committee. The five and a half million members of the 16,000 clubs affiliated with the Federation will use the slogan, "A Million and One in '61," to popularize the use of automobile seat belts and thus reduce the possibilities of severe injury, disfigurement, and death in highway accidents.

Tire manufacturers and auto manufacturers are cooperating with this crusade as are the National Medical Association, Automotive Safety Foundation, National Safety Council, National Automobile Dealers Association, National Tire Dealers & Retreaders Association, the President's Committee for Traffic Safety, and the United States Public Health Service.

Dealers and other retail outlets handling TBA or other related products represented by these industries and the organizations have been alerted and advised to extend prompt and courteous attention to each customer's seat belt needs. It is hoped that this crusade will make a major contribution toward getting seat belts adopted.

Nylon, Cotton Woven In Solid Carcass Belt

In the article, "Conveyor Belts Move into New Fields," published in the April issue of RUBBER WORLD, an omission was inadvertently made in the description of solid-carcass belting.

On page 79, paragraph 4, the first sentence reads, "The solid-woven carcass is woven on one loom as a unit, made of heavy-duty cotton cords which are interwoven in both the warp and filler directions." The words "with nylon" were omitted. The last part of the sentence should read ". . . made of heavy-duty cotton cords which are interwoven *with nylon* in both the warp and filler directions."

As noted in the article, the solid-woven carcass belt is one of the more significant recent developments in the conveyor belt field. Increased tensile strength of synthetic fibers has made it possible to build a solid-carcass or single-ply belt which is lighter and more flexible than the conventional multi-ply belts for a maximum in training and troughing on idlers, but with a tensile strength of 210 pounds per inch, the maximum for a four-ply, 48-ounce cotton belt. Decreased cover separation is another advantage of this type of belt, manufacturers say.

The CEPAR Apparatus—II[1]

Evaluation of Progressive Changes in Elastomer Properties during Vulcanization

State and rate of cure, optimum cure, scorch, induction time for both cure and reversion, rate and degree of reversion may all be measured on this new CEPAR (cure, extrusion, plasticity and recovery) machine, with demonstrated advantages in time and stock savings

By W. E. CLAXTON, F. S. CONANT, and J. W. LISKA
Firestone Tire & Rubber Co., Akron, O.

EVALUATIONS of state of cure and of rate of cure of elastomers have been the subject of a great number of investigations reported in rubber literature. These have resulted in the development of a number of test methods, which have been well summarized by Juve (1).[2] The most commonly used test is a highly subjective combination of tensile modulus, ultimate elongation, and rupture strength, although it has been pointed out by Schade (2) that experienced compounders may reach a wide range of "optimum" cures, all based on a given set of data. A greater precision has been claimed by Schade and by Stiehler and Roth (3, 4) for a dead-weight strain test method for evaluating cure. A nearly absolute measure of degree of vulcanization by a swelling method has been claimed by Kraus (5).

In a method described by Peter and Heidemann (6) and by Payne (7), a dynamic shear modulus is measured during the progress of vulcanization and reversion, thus obtaining a complete curve of modulus *vs.* cure time on a single specimen.

A similar method is used in the recently marketed Wallace-Shawbury Curometer (8, 9). One drawback to this method is that the specimen cures under no hydrostatic pressure, resulting in variable porosity. In all of the methods described by Juve (1) it is necessary to cure specimens to each of the states for which data are desired and then run the appropriate physical test, which procedure consumes a great deal of both time and sample material.

It is often advantageous to know certain curing parameters besides the time for "optimum" cure. Stiehler and Roth (3) decided that three parameters are necessary to describe curing properties, (a) scorch time, (b) rate of cure, and (c) a structural factor which may be associated with the inherent stiffness of the rubber compound. In one series of tests they obtained all of these factors on their strain tester. In another series they used a Mooney viscometer for evaluating scorch time. Gee and Morrell (10), among others, preferred to use the Mooney instrument for scorch time, while depending upon modulus tests for cure rate and state of cure.

Juve (11) has suggested a method for obtaining optimum cure times as well as scorch times from the Mooney viscometer. The advantage of a single instrument and test procedure for determining all of the desired parameters is obvious.

The test described in this paper yields objective indices for: (a) scorch time (first observable stiffening), (b) induction time (extrapolation of curve to zero cure), (c) curing rate, (d) time for attainment of any specified percentage of full cure, (e) induction time for start of reversion, (f) reversion rate, and (g) time for reversion to cause any specified percentage loss in the fully cured modulus. The method is based on measurements of progressive modulus change during cure, following Fletcher, Gee, and Morrell (12) in the use of modulus as a measure of the state of cure.

It was shown in an earlier work (13) that the state of cure of an elastomer could be represented by the ratio of a Young's modulus M at cure time T to the corresponding modulus M_∞ at full cure, and that this ratio could be represented adequately by an equation derived from a first-order reaction hypothesis,

$$M/M_\infty = 1 - e^{-k(T-T_0)}$$

wherein k is a curing rate constant, and T_0 is the induction period, or cure time before the modulus starts increasing significantly, and e = 2.718 . . . is the natural logarithm base. Stiehler and Roth (3) maintain that a second-order cure reaction theory agrees with facts better than does a first-order reaction. The above equation, however, was found to apply to all of the compounds investigated within the limits of compound reproducibility.

[1]Presented before the Division of Rubber Chemistry, ACS, New York, N. Y., Sept. 15, 1960.
[2]Numbers in parentheses refer to bibliography items at end of this article.

Description of Apparatus

In addition to its use in determining cure parameters, the test apparatus was designed for processability evaluations on polymers and unvulcanized compounds. In order to indicate its complete range of utility it has been termed the CEPAR apparatus (14) (cure, extrusion, plasticity, and recovery). Its use in plasticity determinations is described in a separate report (15), in which an overall description of the apparatus is also given.

Fig. 1. Overall view of four-station CEPAR apparatus

The apparatus in present use (Figure 1) is a four-station model with individual temperature controls for each station and a common chart recorder for all stations. Components of the test chamber are shown in Figure 2. In Figure 3 the test specimen is shown confined in a ¾-inch-diameter chamber heated to the desired temperature by the surrounding electric furnace. Test temperatures are controlled roughly by a manually set autotransformer on the furnace windings and more precisely by a contact relay meter actuated by a thermocouple inserted in the hole shown in the test chamber wall. The latter controls about one-fifth of the applied voltage. By this method the temperature of each unit may be controlled individually within ±1° F. in the range of 77 to 600° F.

A dead weight is applied periodically to the ¼-inch diameter loading plunger by motorized rotation of the cam at predetermined intervals of from one minute to one hour. The load is sufficient to produce a unidirectional compression of about 8% in the uncured specimen; the displaced rubber moves upward against the force of a coil spring. The loading pressure of about 50 psi. applied to the specimen to force the loading beam down to the cam is sufficient to force the plunger tip into the rubber where it remains embedded during the cure. This pressure is also sufficient to produce a non-porous vulcanizate. The load to be used is selected so as to give nearly full-scale recorded deflection on the uncured specimen.

The deflection sensing device is a differential transformer, the core of which is link-connected to the end of the loading beam. Deflections are recorded on a roll chart recorder, the chart drive of which is started automatically one second before the rotating cam allows the full load to be applied to the specimen and is stopped automatically after an on-period of three seconds.

Test Method

Test specimens of raw rubber were either weighed or preformed by extrusion to an essentially constant volume. For normally compounded SBR or natural rubber (NR), 4.2 grams were satisfactory; gum stocks required slightly less, and highly pigmented stocks slightly more. Samples were preformed cold in a pressure mold to approximately a cylindrical shape ¾-inch in diameter by ½-inch high.

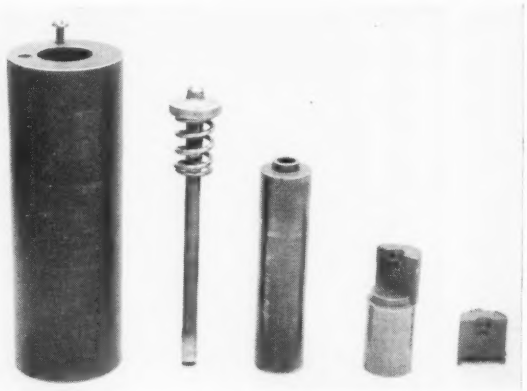


Fig. 2. Components of test chamber for determining curing characteristics of elastomer compounds

With the heating chamber at the desired temperature, and load cycling controls set to proper times, the specimen is inserted at a noted time, and the load applied with the cam positioned to support the major load. Approximately 30 seconds later the cam is rotated to apply the full load to the loading plunger, giving a short trace of the resulting deflection on the recorder chart. Deflections on the succeeding drops increase slightly or remain constant at first as the sample heats up, then decrease continuously during the cure. Usually there is a comparatively long interval after full cure is attained wherein deflections remain fairly constant. As reversion begins, the deflections again increase.

Data Analysis

A reproduction of a typical chart record for a single unit is given in Figure 4. A smooth curve drawn through the deflection maxima shows the progress of both the cure and the reversion processes. The scorch time, indicated by R_S, is the time required for the first observable stiffening. The induction time, R_I, is found by extending the straight line portion of the cure

curve until it reaches the zero cure level. The term R_o will be recognized as the CEPAR measure of the more general term T_o, which appeared in the preceding equation. The time to reach a "practical" 100% cure can be read directly from the chart. Additional significant parameters can also be obtained from the data. Consider the following relations.

Let K = the fractional modulus change of a stock completed after any given curing time
M = modulus at fractional change K
M_i = initial modulus of uncured stock
M_∞ = modulus of fully cured stock

$$\text{then } K = \frac{M - M_i}{M_\infty - M_i} \text{ or } K = \frac{\frac{M}{M_\infty} - \frac{M_i}{M_\infty}}{1 - \frac{M_i}{M_\infty}}$$

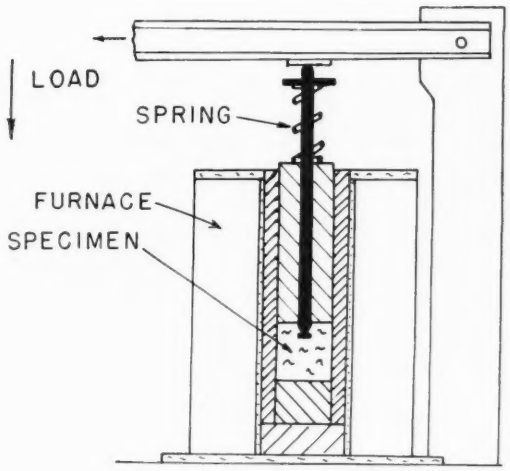


Fig. 3. Schematic diagram of test chamber assembled for determining curing characteristics

since we have taken modulus change as a measure of state of cure. In the latter form it is seen that if M_i/M_∞ (the initial cure) is small as compared with unity, the value of K at any cure time is a measure of the difference in fractional modulus cure that has occurred in the stock. Normally any stock that can be preformed satisfactorily for testing in the apparatus will be at a very low state of cure ($M_i/M_\infty \sim .01$); hence, except for very low cures, the value of K, as given above, will be essentially equal to M/M_∞, our previous definition for state of cure.

The modulus terms in the above expression should be converted into deflection terms for application to a chart record such as that in Figure 4.

Let X = chart deflection at fractional cure K
X_i = initial chart deflection
X_∞ = chart deflection of fully cured stock

$$\text{making } K = \frac{X_i - X}{X} \Big/ \frac{X_i - X_\infty}{X_\infty}$$

since the force is the same at all deflections.
The above equation may be solved for X, giving

$$X = X_i \left[1 + K\left(\frac{X_i}{X_\infty} - 1\right)\right]^{-1}$$

For a 20% cure, for example

$$X_{.2} = X_i \left[1 + .2\left(\frac{X_i}{X_\infty} - 1\right)\right]^{-1}$$

With the deflection for a given state of cure thus determined, the cure time can be read directly from the chart. Use of the chart deflection measurements in this manner avoids the necessity of calculating an absolute Young's modulus since only relative values are required. A 90% cure has been used satisfactorily as "optimum."

The curing rate constant k evaluated from the induction period T_o and the time T required to reach a fractional modulus K is given by:

$$k = (T - T_0)^{-1} \ln [1/(1 - K)]$$

Heat degradation measurements may be analyzed in an analogous manner. Let X_{-p} represent the chart deflection level after a given cure time which has caused a modulus reduction to a fraction P of the undegenerated modulus, then

$$P = \frac{X_i - X_{-p}}{X_{-p}} \Big/ \frac{X_i - X_\infty}{X_\infty}$$

and

$$X_{-p} = X_i \left[1 + P\left(\frac{X_i}{X} - 1\right)\right]^{-1}$$

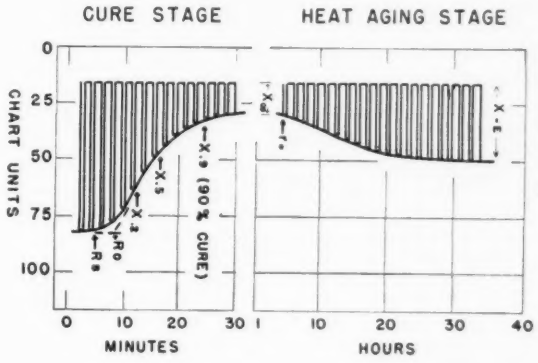


Fig. 4. Typical chart record. Scorch time is indicated by R_S and cure induction time by R_o. The X values are chart deflections at the indicated fractional cure; e.g., $X_{.9}$ is the deflection at 90% of full cure. Reversion induction time is indicated by r_o

The degradation reaction rate constant evaluated from the time r_q, measured from the beginning of the cure run, that is required before the degradation reaction is q x 100% complete is given by:

$$\gamma = (r_q - r_o)^{-1} \ln [1/(1 - q)],$$

where r_o is the time at which the heat aging reaction commenced.

Comparison of Results with Conventional Physical Test Data

State of cure, as evaluated by the CEPAR apparatus, is in good agreement with that determined from tensile modulus tests, as is shown by the data in Table 1. For the cold SBR tread stock tested it had been shown that a 60-minute cure produced very close to the maximum modulus attainable. The degree of cure produced by each of the shorter curing times was determined from the percentage of this maximum modulus attained from both the CEPAR and physical testing data.

TABLE 1. STATE OF CURE OF COLD SBR TREAD STOCK AS DETERMINED BY THE CEPAR TEST AND BY TENSILE MODULUS DATA

Cure Time, 280° F. (Min.)	From CEPAR (% Cure)	Ring Specimen from CEPAR Test Piece (% Cure)		Dumbbell Specimen (% Cure)
		100% Ext.	300% Ext.	300% Ext.
15	50	53	55	53
30	81	83	86	80
45	95	96	99	97
60	100	100	100	100

The ring specimen on which data are given in Table 1 was molded on the bottom of the CEPAR test piece and cut off by a razor blade on a lathe. By this procedure a tensile test specimen is obtained which has exactly the same state of cure as the final state of the CEPAR specimen itself. Other physical measurements may be made on the cured CEPAR cylinder. These include compression modulus (ratio of compressive stress to linear compression) and recovery, hardness, resilience, and specific gravity. A very satisfactory compression modulus measurement can be made on the CEPAR apparatus itself by placing the cured CEPAR cylinder on a separate support under one of the loading arms and using the recorder to measure the resulting deflection. It is thus possible to obtain both CEPAR and a variety of physical testing data on as little as five grams of sample—a definite advantage when evaluating experimental polymers.

In one model of the CEPAR apparatus the loading beam was extended past a knife-edge pivot to form a nearly balanced double beam, which was loaded sufficiently to produce a natural period of oscillation, with the rubber sample in position, of about 0.75 cps. When the load supplied by the beam unbalance was applied suddenly to the loading plunger, damped oscillations were obtained which could be interpreted much as for the Yerzley oscillograph (16). The progressive change in dynamic properties during cure thus obtained showed that, for most stocks, resilience increased monotonically with increase in cure. The dynamic properties, however, lagged behind the static properties. In some cases the most resilient cure was definitely overcured by the normal CEPAR index. Resilience measurements could be obtained on this version of the apparatus either with the specimen in the curing chamber or positioned as for the compression modulus test mentioned above.

The CEPAR scorch time shows good agreement with that obtained on the Mooney viscometer. This is illustrated in Table 2 for a NR tread-type compound. The progressively shorter scorch times were obtained by remilling the stock for the indicated times.

Reproducibility of Results

During the trial runs on the four-station apparatus a study was made of the reproducibility between units and between runs (17). As is shown in Tables 3 and 4 both of these variations were smaller than the residual error. The only significant between runs variance found was in the induction period. Since this parameter was measured rather early in the cure cycle, it may have been affected by unequal cooling of the heating chambers during the specimen insertion. This source of error has been reduced by insertion at the top rather than the bottom of the chamber, whereby it is unnecessary to remove the chamber from the furnace.

TABLE 2. SCORCH TIME OF NR TREAD STOCK AS DETERMINED BY CEPAR TEST AND BY THE MOONEY VISCOMETER

Remill Time (Min. @ 240° F.)	CEPAR Scorch Time (Min. @ 250° F.)	Mooney Scorch Time (Min. @ 250° F.)
0	32.5	25
2	27.5	27
6	21.0	24
10	17.5	18
20	7.5	7

The between-units variation in curing rate constant and time to 90% cure shown in Table 4 was traced to unit #4 which appeared to be operating somewhat hotter than did the other units. This difficulty was corrected simply by closer attention to proper setting of the controls.

Values found for the various curing parameters are not influenced appreciably by the frequency of load application during the test, as is shown by the data in Table 5. The choice of load cycle to be used is usually based on the expected curing rate of the test specimen. A fast curing stock would be tested at a high loading frequency in order to provide a sufficient number of chart readings for a smooth curve to be drawn.

Use As a Screening Test

In many compounding studies it is desirable to be able to evaluate a large number of ingredients which may affect the cure in an unknown manner. Some might accelerate the cure to such a degree that the shortest time used in a conventional tensile test would produce an overcure; while others might be extremely slow curing. In either case an appreciable saving in testing time could be determined approximately by a preliminary screening test. For this need the CEPAR test has been found to be very satisfactory, especially

TABLE 3. REPRODUCIBILITY DATA—FOUR-UNIT CEPAR APPARATUS

(NR Tread Compound, 280° F. Test Temp., 4.2-Gm. Sample, 4.5-Lb. Load, 1¼-Min. Cycle)

Induction Period, R_0 (Min.)					Time to 50% Cure, $R_{.5}$ (Min.)				
Run No.	Unit 1	2	3	4	Run No.	Unit 1	2	3	4
1	9.0	7.7	8.3	9.7	1	16	15	16	15
2	11.0	9.6	7.8	9.7	2	15	17	14	15
3	10.0	11.0	10.0	9.7	3	17	17	17	16
4	9.5	9.7	9.3	8.6	4	15	17	16	14
5	9.6	9.0	9.4	9.7	5	15	16	16	15
6	9.1	8.9	7.8	8.4	6	15	16	14	12
	Avg. R_0 = 9.3 min.					Avg. $R_{.5}$ = 15.5 min.			

Time to 90% Cure, $R_{.9}$ (Min.)					Cure Rate Constant, k (Min.$^{-1}$)				
Run No.	Unit 1	2	3	4	Run No.	Unit 1	2	3	4
1	33	32	34	29	1	0.095	0.095	0.088	0.12
2	27	36	29	29	2	0.14	0.087	0.11	0.12
3	32	30	32	31	3	0.10	0.12	0.10	0.11
4	33	34	33	28	4	0.13	0.095	0.096	0.12
5	29	33	33	26	5	0.12	0.095	0.099	0.14
6	30	32	27	21	6	0.11	0.10	0.12	0.19
	Avg. $R_{.9}$ = 30.5 min.					Avg. k = .11 min.$^{-1}$			

TABLE 4. ANALYSIS OF VARIANCE SHOWN BY DATA IN TABLE 3*

	Degrees of Freedom	Mean Square	Standard Deviation
Induction Period, R_0			
Between units	(3)	1.24	Insignificant
Runs	5	1.70	0.5 min.
Residual error	15+(3)	0.726	0.9 min.
Time to 50% Cure, $R_{.5}$			
Between units	(3)	0.72	Insignificant
Runs	(5)	2.45	Insignificant
Residual error	15+(3)+(5)	1.48	1.2 min.
Time to 90% Cure, $R_{.9}$			
Between units	3	32.4	2.0 min.
Runs	(5)	11.3	Insignificant
Residual error	15+(5)	7.5	2.6 min.
Curing Rate Constant, k			
Between units	3	0.00149	0.014 min.$^{-1}$
Runs	(5)	0.00041	Insignificant
Residual error	15+(5)	0.00036	0.019 min.$^{-1}$

*According to the method in reference (17).

TABLE 5. EFFECT OF FREQUENCY OF LOAD APPLICATION ON MEASURED CURE PARAMETERS OF A NR TREAD-TYPE COMPOUND

Load Cycle (Min.)	R_0 (Min.)	$R_{.5}$ (Min.)	$R_{.9}$ (Min.)	k (Min.$^{-1}$)
1.25	9.3	15.5	30.5	0.11
2.5	10.5	16.8	32.8	0.11
5	10.0	17.0	33.0	0.10

Conditions: 280° F., 4.2-gm. samples, 4.5-lb. load.

when dealing with experimental polymers or compounding ingredients in short supply.

Optimum cure for one physical property may not always be optimum for another property. For example, life in a sidewall flexing apparatus was found to be longer for undercures (K ~ 0.5) or overcures (K ~ —0.7) than for "normal" cures (K = 0.9 to 1.0). On the other hand, hysteresis properties were best for normal cures and became sharply poorer for both undercured and overcured states. A summary of the effect of state of cure on eight physical properties of an NR stock is given in Table 6.

In the evaluation of rubber chemicals the appropriate physical tests should be made on vulcanizate samples which have been cured to a given state. In the region of flat cure, where stress-strain properties are nearly constant, significant variations in other properties may occur which would affect the evaluation of the ingredient being tested.

Use On Very Stiff Compounds

Some experimental compounds are too stiff to be tested for scorch on the Mooney plastometer. In general, however, this index can be obtained on the CEPAR apparatus. An illustration is given in Table 7 showing how increasing amounts of the rubber from prevulcanized latex decreased the scorch time of a pale crepe natural rubber compound.

Use As a Millroom Control Instrument

Millroom control tests are made on each batch of factory stock as a check on proper compounding. Normally these tests are limited to specific gravity determinations and modulus tests on a single cure, thus giving very little information about any stock that might be outside the control limits on the properties. The CEPAR test is capable of yielding the required basic information with a minimum of test time, plus additional important information regarding both curing characteristics and physical properties of the vul-

TABLE 6. EFFECT OF STATE OF CURE ON VARIOUS PHYSICAL PROPERTIES OF NR SIDEWALL-TYPE STOCK

	Undercure		Normal Cure		Overcure		
Cure time @ 280° F., min.	16.5	22.5	35	50	180	270	840
Fractional modulus, K	0.5	0.7	0.9	1.0	−0.9	−0.8	−0.7
1. Normal stress-strain (ASTM D 412)	Poor		Good			Poor	
2. Oven aging, 2 days @ 212° F. (ASTM D 573)	Good		Fair			Poor	
3. Oxygen bomb aging, 96 hr. (ASTM D 572)	Fair		Good			Fair	
4. Hysteresis (Firestone shear vibrometer)	Poor		Good			Poor	
5. Sidewall flexing (ASTM D 430)	Good		Poor			Good	
6. Crack initiation (Firestone method)	Fair		Poor			Good	
7. Oxygen absorption (Firestone method)	Good		Fair			Poor	
8. Ozone resistance (ASTM D 1149)	Fair		Good			Fair	

canizate. By a simple test chamber substitution it is also possible to evaluate quickly a number of extrusion properties.

As an illustration of this type of use, consider the data shown in Table 8. After assuming that these specimens were a representative set, the mean values and probable errors shown at the bottom of the table were calculated. With these data as a basis a transparent overlay template shown in Figure 5 was prepared. The central dotted curve represents the average cure curve for the 15 samplings. The lower line is the slowest cure rate, the longest induction period, and the smallest initial-final deflection difference allowable. The upper line is the fastest cure rate, the shortest induction period, and the largest initial-final deflection difference allowable.

TABLE 7. CEPAR SCORCH ON STIFF COMPOUNDS

Compound	Scorch Time (Min. @ 250° F.)
Hevea pale crepe	23
Pale crepe + 20% prevulcanized latex	17.5
Pale crepe + 35% prevulcanized latex	7.3
Pale crepe + 50% prevulcanized latex	5

In using this template the arrow of the recorder is placed on the chart to coincide with the 30-second reading of the specimen deflection under load. The template is then alined with the chart paper, and the cure curve observed to fall within or without the chosen ranges. In using this template alone as a control criterion, it would be necessary to allow the cure to proceed only long enough to determine whether or not it was within the prescribed limits.

The above method gives three parameters by which the stock might be rejected—the induction period, the cure rate, and the extent of cure; whereas the conventional millroom control tests give only one—the modulus at a given cure time. Consider, for example, a stock which had been given a double measure of curing agent or accelerator. It could well be within modulus

TABLE 8 CEPAR DATA ON 15 BATCHES OF A COLD SBR TREAD TYPE COMPOUND

Sample No	Induction Period R_0 (Min.)	Curing Rate k (Min^{-1})	Initial-Final Chart Deflection, (Chart Units)	Compression Modulus (psi.)	Specific Gravity
1	3.68	0.500	29.5	565	1.150
2	3.48	0.480	32.3	505	1.155
3	3.73	0.342	35.2	485	1.150
4	3.45	0.400	33.0	585	1.150
5	3.32	0.380	34.6	533	1.150
6	3.68	0.380	32.0	524	1.150
7	3.98	0.390	35.2	520	1.148
8	3.79	0.420	34.0	475	1.145
9	3.78	0.425	35.5	555	1.148
10	4.62	0.460	37.6	680	1.155
11	4.12	0.403	31.4	610	1.155
12	4.22	0.400	34.4	550	1.155
13	4.02	0.380	35.0	645	1.155
14	4.88	0.318	30.5	532	1.150
15	4.57	0.380	34.0	545	1.155
Average	3.92	0.404	33.7	555	—
Probable error	±0.3 (±8%)	±.032 (±8%)	±1.31 (±3%)	±36 (±6.5%)	

Conditions: 328° F. cure, 4.2-gm. specimens, 4.5-lb load, one-minute cycles, samples cured 14.5 min.

limits, but on the reversion side of the cure curve. Such a batch could pass the normal millroom control test and cause much difficulty in further processing stages. The CEPAR apparatus cure curve would, however, reject every such batch.

If physical testing data on the vulcanizate are desired, compression modulus and specific gravity data, as shown in Table 8, may be obtained on the cured CEPAR specimen, or tensile data may be obtained on the ring cut from the bottom of the specimen, as previously described.

Use in Measuring Reversion

An elastomer kept confined at curing temperature for prolonged periods will usually show a heat effect wherein the modulus begins to decrease at a particular time, proceeds exponentially, and eventually levels off. Typical modulus changes during the cure and heat degradation of an NR compound and of a cold SBR compound, as shown by the CEPAR apparatus, are shown in Figure 6. Although modulus retention has not been investigated thoroughly, it may be a factor in tread wear (18). Modulus retention factors (P), measured after the modulus had leveled off, ranging from 38% to 92% have been measured on NR tread-type compounds in which the accelerator had been varied. Such a wide range of values should be reflected in any service application where additional heat history is acquired.

Induction times required for reversion to start may also vary widely. A range of from 12 to 100 minutes was observed, for example, in a series of NR and NR/cold SBR blends. Reaction rates for reversion on the same compounds ranged from 0.007 to 0.045 $min.^{-1}$. These measurements represent physical properties to which little attention has been given in the literature.

Discussion

The CEPAR modulus test for cure differs from conventional tests in several respects which might appear at first impression to make it incomparable with

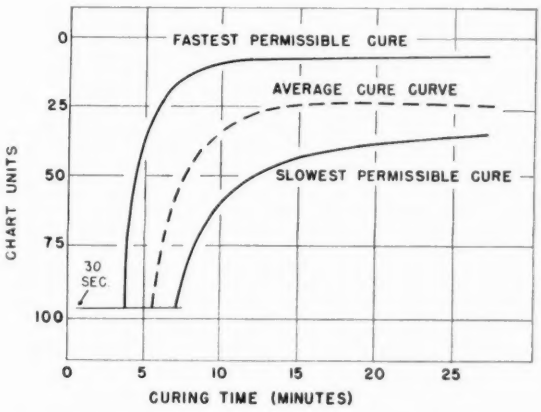


Fig. 5. Relative modulus cure curves of cold SBR tread-type compound for template for mill room control

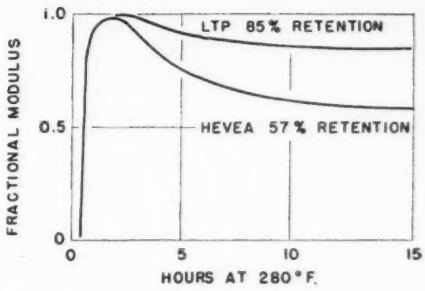


Fig. 6. Relative modulus cure and heat degradation curves for cold SBR and natural rubber compounds

them. These differences include: (a) test is made at curing temperature rather than room temperature; (b) no rest period between curing and testing is possible; (c) deflections are small, about 8% unilateral compression; (d) cures are made under pressures (about 50 psi.) considerably less than those normally used on physical testing samples; and (e) the first deflection measurements may be made before the specimen has reached equilibrium temperature (it requires about four minutes for the interior of the specimen to attain 98% of the differential between room temperature and the curing temperature).

It should be pointed out again in view of the above points that no attempt is made to measure absolute modulus in the CEPAR test, but only the relative change in modulus between the uncured and the fully cured specimen. It has been shown, as by the data in Table 1, that this method yields a value for degree of cure that is in agreement with that obtained by more conventional methods. In regard to item (d) above, it was found during developmental work on the apparatus that a weak spring holding the plunger in the specimen did indeed cause a porous vulcanizate. This condition was eliminated by substituting a stiffer spring. No significant effect of curing pressure within the normal range used has been found, provided it is sufficient to prevent sample porosity.

In regard to item (e) above, it is necessary to disregard plunger deflection readings obtained before the maximum deflection is reached, at which time the specimen may be regarded as having reached thermal equilbrium. This in no way interferes with the measurements. Curing time is regarded as starting at the instant the specimen is inserted into the hot curing chamber.

Summary and Conclusions

An apparatus and method have been described for evaluating state of cure, optimum cure time, rate of cure, induction time for cure, scorch time, induction time for reversion, reversion rate, and degree of reversion of elastomeric compounds. Coincident with these determinations, vulcanizate specimens may be prepared on which more conventional physical test data may be obtained, e.g., compression modulus, compression set, hardness, specific gravity, tensile modulus, and elongation.

In essence, the method described provides a progressive measure of the change in Young's modulus during cure or reversion through the change in deformation of a periodically loaded plunger, one end of which is embedded into the specimen. Typical results have been presented which show application of the apparatus to screening tests, mill room control, reversion studies, and to compounds too stiff for analysis by conventional test methods.

Demonstrated advantages for the apparatus include time saving, stock saving, and better cure information on a wider range of polymeric compounds than is obtainable from tensile test methods. In a laboratory where a large selection of test instruments is not feasible, the versatility of the apparatus described should prove very advantageous.

Acknowledgments

A great many members of the Firestone research organization contributed toward the development and evaluation of the CEPAR apparatus, especially in demonstrating its range of application. The continued interest and encouragement of F. W. Stavely is especially acknowledged, as are the helpful suggestions made by Sydney Smith.

The permission of The Firestone Tire & Rubber Co. to publish the work is greatly appreciated.

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Safety Check New Equipment

One aspect of safety often overlooked is that of very thoroughly checking out used or even new equipment that is just being installed. No machine or other device should be put into operation without a complete examination by a qualified safety engineer.

Most manufacturers of new equipment will include the basic elements of guards or safety switches, but complete compliance with the rules or specific adaptations of your own company should be insured. This inspection is necessary to take into account the particular location problems of the installation as well as general safety features of the machine itself.

Used or rebuilt equipment should be given a very rigid inspection, of course, to be sure that the latest ideas of what is required in the way of safety devices have been included. Obsolete or ineffective safety features may not be rectified during reconditioning or rebuilding.

In addition to assuring that the desired attachments are present, a check should be made to see that they are in operating condition and that they perform within the necessary tolerances.

This vital final check must be made in every case and under no circumstances, no matter how urgently production is needed, should it be omitted.

Oxides' Effect on Plasticity

(*Continued from page 66*)

heat generated during mixing with all of the five samples of synthetic rubber tested.

Appendix

Trade Name	Description	Supplier
Chemigum N600	NBR, medium nitrile content	Goodyear Tire & Rubber Co., chemical division, Akron, O.
Endor	Zinc salt of pentachlorothiophenol	E. I. du Pont de Nemours & Co., Inc., elastomer chemicals department, Wilmington 98, Del.
Enjay Butyl 268	Medium unsaturation grade	Enjay Co., Inc., Butyl Division, New York 19, N. Y.
Maglite D	Magnesium oxide	Merck Marine Magnesium Division, Merck & Co., Rahway, N. J.
PC-640	Thioxylenols (40%) in hydrocarbon solution	Pitt-Consol Chemical Co., Newark 5, N. J.
Pepton 22	2.2′ Dibenzamide diphenyl disulfide	American Cyanamid Co., rubber chemicals department, Bound Brook, N. J.
Pepton 65	Zinc 2-benzamidothiophenate	American Cyanamid Co., rubber chemicals department
Protex 166	Zinc oxide	New Jersey Zinc Co., New York 38, N. Y.
RPA-2	Naphthyl-beta-mercaptan (⅓) plus inert hydrocarbon	Du Pont elastomer chemicals department
RPA-3, Conc.	Xylyl mercaptan (71%) plus inert hydrocarbon	Du Pont elastomer chemicals department
RPA-6	Pentachlorothiophenol (90%) in wax	Du Pont elastomer chemicals department

Available Dry Synthetic Rubbers Except SBR–I

A listing of the commercially available acrylic, CR, chlorosulfonated polyethylene, fluorocarbon, IIR, NBR, polyisobutylene, polysulfide, silicone, and urethane rubbers in the United States and Canada

THIS listing is a continuation of the RUBBER WORLD series giving the latest information on elastomeric materials in an easy-to-compare format. Previous listings have covered the SBR types, styrene-butadiene resins, and synthetic rubber latices.

Material Covered

This month we feature the dry synthetic rubbers except for the SBR's which have already been presented. The information was furnished by suppliers for inclusion in the third edition of the book, "Compounding Ingredients for Rubber." Although this book, containing this same information, has been published and mailed to prepublication subscribers, we felt that it would be useful for additional coverage to present this synthetic rubber data here in RUBBER WORLD.

Since the subject of how the various rubbers in this list are used has been the basis for several books and, even so, no one has been able to make a complete list, it would be very presumptuous to try to give much in the way of use or processing data in this introduction. Every one of the suppliers of these materials has descriptive brochures available, and most have technical service laboratories from which specific information may be obtained.

Stereoregular polyisoprene and polybutadiene have been left out of this list even though they are also synthetic rubbers. This omission was done deliberately because of lack of information at present on some of the newer commercial offerings. As soon as we can obtain sufficient information from present suppliers and others soon to come on stream, we will run another in this series of listings to cover these grades.

Abbreviations Explained

The information is presented under the following headings:

COMP: The basic composition of the rubber.

SUP: The name of the supplying company.

PHY PROP: Physical properties of the raw rubber including the form and package as supplied.

PROC PROP: Processing information on the rubber, special emphasis on any specific problems which might be encountered.

VUL PROP: Vulcanizate properties. This heading often includes properties ascribed to the rubber itself which make it useful in certain applications such as oil resistance or weather resistance, etc.

SYNTHETIC RUBBERS

Acrylic

Hycar 4021

COMP:	Acrylic ester copolymer.
SUP:	B. F. Goodrich Chemical Co.
PHY PROP:	Powder supplied in 60-lb. bags. Sp. gr., 1.09.
PROC PROP:	Can be processed on standard equipment.
VUL PROP:	Has very good oil and air resistance at temperatures above 300° F. Produces ozone, light, and flex resistant compounds.

Paracril OHT

COMP:	A butyl acrylate ester/acrylonitile elastomer specially designed for resistance to high temperatures.
SUP:	Naugatuck Chemical Div., U. S. Rubber Co.
PHY PROP:	Amber-colored rubber supplied in bale form. Sp. gr., 1.05. Mooney viscosity (ML-2 at 212° F.), 35-45.
PROC PROP:	Compounded and processed in a manner similar to NR and SBR. Processing procedures require refined techniques to prevent sticking and splitting. Particular care must be taken to add liquid and resinous materials slowly. Amine materials will cure it. Reinforcing agents such as the high abrasion furnace carbon blacks bring out its optimum physical properties. In applications where low compression set is needed, post curing at 300° F. is suggested.
VUL PROP:	Recommended for applications requiring resistance to high temperatures, hot oils, and extreme pressure lubricants, flex cracking, ozone, sunlight, oxidation, and gas permeability.

Chloroprene (CR)

Neoprene Type AC

COMP:	Polymer of 2-chlorobutadiene 1,3.
SUP:	E. I. du Pont de Nemours & Co., Inc. (Elastomer Chemicals Dept.).
PHY PROP:	Cream to light green chips. Sp. gr., 1.23. Supplied in 50-lb. bags.
PROC PROP:	May be processed on normal rubber or cement making equipment.
VUL PROP:	Used chiefly for quick-setting, high-strength adhesive cements.

Neoprene Type AD

COMP:	Polymer of 2-chlorobutadiene 1,3.
SUP:	E. I. du Pont de Nemours & Co., Inc. (Elastomer Chemicals Dept.).

PHY PROP: Silvery white chips. Sp. gr., 1.23. Supplied in 50-lb bags.
PROC PROP: May be processed on normal rubber or cement making equipment. Has greater viscosity and color stability than Neoprene Type AC.
VUL PROP: Used chiefly for quick-setting, high-strength solvent type cements.

Neoprene Type CG

COMP: Polymer of 2-chlorobutadiene, 1,3.
SUP: E. I. du Pont de Nemours & Co., Inc. (Elastomer Chemicals Dept.).
PHY PROP: Amber to light green chips. Sp. gr., 1.23. Supplied in 50-lb. bags.
PROC PROP: May be processed on normal rubber or cement making equipment.
VUL PROP: Used chiefly for quick-setting, high-strength adhesive cements.

Neoprene Type FB

COMP: Polymer of 2-chlorobutadiene 1,3.
SUP: E. I. du Pont de Nemours & Co., Inc. (Elastomer Chemicals Dept.).
PHY PROP: Dark-olive putty-like solid of very low molecular weight. Sp. gr., 1.23. Supplied in 100-lb. fiber drums.
PROC PROP: May be incorporated in neoprene or other synthetic elastomers.
VUL PROP: A vulcanizable plasticizer used in cement applications which require a high solids-to-viscosity ratio. Useful in preparation of calks and sealants.

Neoprene Type GN

COMP: Polymer of 2-chlorobutadiene 1,3.
SUP: E. I. du Pont de Nemours & Co., Inc. (Elastomer Chemicals Dept.).
PHY PROP: Amber chips. Sp. gr., 1.23. Supplied in 50-lb. bags.
PROC PROP: Processed on normal rubber equipment.
VUL PROP: A general-purpose CR for products that must withstand the action of oils, solvents, heat, oxidation, and sunlight.

Neoprene Type GN-A

COMP: Polymer of 2-chlorobutadiene 1.3 containing a discoloring antioxidant.
SUP: E. I. du Pont de Nemours & Co., Inc. (Elastomer Chemicals Dept.).
PHY PROP: Amber chips. Sp. gr., 1.23. Supplied in 50-lb. bags.
PROC PROP: Processed on normal rubber equipment.
VUL PROP: A general-purpose CR for products that must withstand the action of oils, solvents, heat, oxidation, and sunlight.

Neoprene Type GRT

COMP: Polymer of 2-chlorobutadiene 1,3.
SUP: E. I. du Pont de Nemours & Co., Inc. (Elastomer Chemicals Dept.).
PHY PROP: Amber chips. Sp. gr., 1.23. Supplied in 50-lb. bags.
PROC PROP: Provides good retention of building tack and flexibility of uncured stocks.
VUL PROP: Vulcanizates have superior resistance to hardening due to elastomer crystallization.

Neoprene Type KNR

COMP: Polymer of 2-chlorobutadiene 1,3.
SUP: E. I. du Pont de Nemours & Co., Inc. (Elastomer Chemicals Dept.).
PHY PROP: Amber chips. Sp. gr., 1.23. Supplied in 50-lb. bags.
PROC PROP: May be processed on normal equipment.
VUL PROP: Used chiefly in paints and putties, for lining tanks and chemical equipment.

Neoprene Type S

COMP: Polymer of 2-chlorobutadiene 1,3 containing a non-discoloring antioxidant.
SUP: E. I. du Pont de Nemours & Co., Inc. (Elastomer Chemicals Dept.).
PHY PROP: Amber chips. Sp. gr., 1.20. Supplied in 50-lb. bags.
PROC PROP: May be used alone or a stiffener for other CRs.
VUL PROP: Used chiefly in crepe soles for resistance to softening, oils, and gasoline.

Neoprene Type W

COMP: Polymer of 2-chlorobutadiene 1,3.
SUP: E. I. du Pont de Nemours & Co., Inc. (Elastomer Chemicals Dept.).
PHY PROP: Silver-grey to light-amber chips. Sp. gr., 1.23. Supplied in 50-lb. bags.
PROC PROP: Has greater storage stability, better processing characteristics, and better color retention during cure than the G-type neoprenes. Does not contain sulfur or thiuram stabilizers.
VUL PROP: A general-purpose CR.

Neoprene Type WB

COMP: Polymer of 2-chlorobutadiene 1,3.
SUP: E. I. du Pont de Nemours & Co., Inc. (Elastomer Chemicals Dept.).
PHY PROP: Silver-grey or light-amber chips. Sp. gr., 1.23. Supplied in 50-lb. bags.
PROC PROP: Gives good surface appearance to extruded goods and will produce calendered items which must be very smooth and resist shrinkage.
VUL PROP: It is similar to Type WX in crystallization resistance.

Neoprene Type WHV

COMP: Polymer of 2-chlorobutadiene 1,3.
SUP: E. I. du Pont de Nemours & Co., Inc. (Elastomer Chemicals Dept.).
PHY PROP: Silver-grey or light-amber chips. Sp. gr., 1.23. Supplied in 50-lb. bags.
PROC PROP: May be used alone or as stiffener for other CRs. Has high viscosity for use in compounds containing large amounts of fillers and oils.
VUL PROP: A general-purpose CR for production of low pound volume cost stocks.

Neoprene Type WRT

COMP: Polymer of 2-chlorobutadiene 1,3.
SUP: E. I. du Pont de Nemours & Co., Inc. (Elastomer Chemicals Dept.).
PHY PROP: Silver-grey or light-amber chips. Sp. gr., 1.25. Supplied in 50-lb. bags.
PROC PROP: Has excellent storage stability, processing properties, and wide latitude in compounding.
VUL PROP: A general-purpose CR having superior resistance to hardening due to elastomer crystallization.

Neoprene Type WX

COMP: Polymer of 2-chlorobutadiene 1,3.
SUP: E. I. du Pont de Nemours & Co., Inc. (Elastomer Chemicals Dept.).
PHY PROP: Silver-grey to light-amber chips. Sp. gr., 1.24. Supplied in 50-lb. bags.
PROC PROP: Has excellent storage stability, processing properties, and wide latitude in compounding.
VUL PROP: A general-purpose CR having better resistance to stiffening due to crystallization than Type W.

Chlorosulfonated Polyethylene

Hypalon 20

COMP: Chlorosulfonated polyethylene.
SUP: E. I. du Pont de Nemours & Co., Inc. (Elastomer Chemicals Dept.).
PHY PROP: White chips. Sp. gr., 1.10. Supplied in 50-lb. bags or boxes.
PROC PROP: "Hypalon" compounds may be processed by conventional methods, but require some special building techniques.
VUL PROP: Produces products which are oil resistant, not attacked by ozone, have excellent color stability, and resistance to heat.

Hypalon 30

COMP: Chlorosulfonated polyethylene.
SUP: E. I. du Pont de Nemours & Co., Inc. (Elastomer Chemicals Dept.).
PHY PROP: White chips. Sp. gr., 1.28. Supplied in 50-lb. boxes.
PROC PROP: A solution-type material for protective and decorative coatings, a paint base.
VUL PROP: Gives coatings resistance to weathering, ozone, many oils, and chemicals.

Hypalon 40

COMP: Chlorosulfonated polyethylene.
SUP: E. I. du Pont de Nemours & Co., Inc. (Elastomer Chemicals Dept.).
PHY PROP: White chips. Sp. gr., 1.18. Supplied in 50-lb. bags.
PROC PROP: An improved elastomer designed for ease in processing.
VUL PROP: Has excellent oil and heat resistance combined with exceptional color stability and weatherability.

Fluorocarbon Rubbers

Fluorel Brand 2141 Elastomer

COMP: Copolymer of vinylidene fluoride and hexafluoropropylene.
SUP: Minnesota Mining & Mfg. Co. (Chemical Division).
PHY PROP: Available as raw gum. Sp. gr., 1.85. Color, off-white. Hardness, Shore A, 40.
PROC PROP: Excellent storage stability. May be processed on conventional equipment. May also be used as coating or laminate. Ideal Mooney scorch rating insures fast, uniform cure with fewer rejects. Plasticity aids milling, mixing, and cutting processes.
VUL PROP: Meets specification MIL-R-25897C. Resists corrosive chemicals, fuels, and solvents. Highly resistant to ozone. Withstands temperatures of 400° F. for continuous long-time service, 600° F. for short periods of exposure. Has low compression set.

KEL-F Brand Elastomer 3700

COMP: Copolymer of chlorotrifluoroethylene and vinylidene fluoride.
SUP: Minnesota Mining & Mfg. Co. (Chemical Division).
PHY PROP: Available as raw gum. Sp. gr., 1.85. Color, off-white. Hardness, Shore A, 45.
PROC PROP: Can be mixed on conventional equipment and can be compression molded, extruded, and calendered on inverted L-type equipment. Soluble in ketones, ethers, and esters for dip, knife, or roll coatings. Can be laminated to metals and fabrics with adhesives.
Vul Prop: Superior resistance to aromatic-type fuels and solvents at high temperatures. Has low-temperature flexibility.

KEL-F Brand Elastomer 5500

COMP: Copolymer of chlorotrifluoroethylene and vinylidene fluoride.
SUP: Minnesota Mining (Chemical Division).
PHY PROP: Available as raw gum. Sp. gr., 1.85. Color, off-white. Hardness, Shore A, 45.
PROC PROP: Same as KEL-F 3700.
VUL PROP: Superior resistance to strong oxidizing acids.

Viton A

COMP: Fluoroelastomer.
SUP: E. I. du Pont de Nemours & Co., Inc. (Elastomer Chemicals Dept.).
PHY PROP: White translucent solid. Sp. gr., 1.82. Supplied in 50-lb. drums.
PROC PROP: Stocks should be mixed on as cool a mill as possible as polymers become soft and stick to hot mill rolls. High specific gravity indicates that larger batch sizes than other polymers should be used.
VUL PROP: Used for products that must withstand unusually high temperatures up to 600° F. in air, chemicals, or most liquids.

Viton A-HV

COMP: Fluoroelastomer.
SUP: E. I. du Pont de Nemours & Co., Inc. (Elastomer Chemicals Dept.).
PHY PROP: White translucent solid. Sp. gr., 1.82. Supplied in 50-lb. drums.
PROC PROP: Same as "Viton" A.
VUL PROP: Higher viscosity than "Viton" A with some improvement in high-temperature strength and greater resistance to blistering. Withstands temperatures up to 600° F. in air, chemicals, and most liquids.

Viton B

COMP: Fluoroelastomer.
SUP: E. I. du Pont de Nemours & Co., Inc. (Elastomer Chemicals Dept.).
PHY PROP: White translucent solid. Sp. gr., 1.86. Supplied in 50-lb. drums.
PROC PROP: Same as "Viton" A.
VUL PROP: Has increased heat and chemical resistance at temperatures up to 600° F. in air, chemicals, or most liquids.

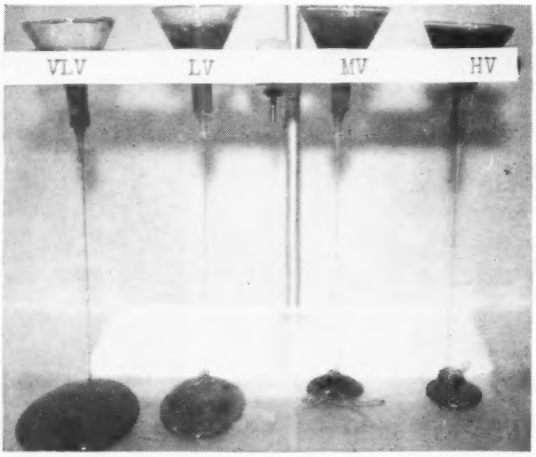
(To be continued)

Flosbrene Liquid SBR

This new form of SBR has processing advantages for many applications and many possibilities

THE first series of liquid styrene-butadiene rubbers has been announced by American Synthetic Rubber Corp. This first series contains 25% bound styrene and is thus designated Flosbrene-25. It is available in four viscosity ranges; VLV—very low viscosity, LV—low viscosity, MV—medium viscosity, and HV—high viscosity.

Flosbrene, series I, contains fatty (as stearic) acid, is stabilized by 1.25% by weight of antioxidant (staining or non-staining may be specified), and the normal total ash content will be in the order of 1.0% with about 0.75 of this soluble in nature.



The four viscosity grades of Flosbrene are shown flowing from the funnels to illustrate the basic character and liquidity of this new SBR type

The various viscosity grades are as follows:

	Viscosity-Poises		Fluid Nature	
Flosbrene	25° C. (77° F.)	45° C. (113° F.)	Room Temp.*	150° F.
—VLV	less than 500	—	easy flow	very easy flow
—LV	500–2500	—	lazy flow	very easy flow
—MV	2500–7500	365–765	thin paste	easy flow
—HV	7500–12500	765–1135	stiff paste	easy flow

* 70 to 75° F.

Suggested Applications

Some of the suggested applications for ASRC Flosbrene are: pouring or casting in conventional open-top molds where inserts can be pressed into place; rotational casting, such as is used in the manufacture of vinyl balls; frictioning on to fabric by calender, for tires and belts; spread coating by doctor blade, such as rain-proofing or rubber coating; addition to asphalt for pavings, roof coverings, etc.; manufacture of high impact polystyrene resins; hard rubber compounds; cements or adhesives; and as a plasticizer in conventional SBR stocks.

Much of the work to date has been in hard rubber applications. The coarse nature of many fillers used in hard rubber such as hard rubber dust or coal dust make dispersion in Flosbrene very easy. Normal mixers such as Banbury or mill may be used, but it is possible to get satisfactory mixes with ribbon blenders or a two-blade Baker-Perkins mixer. Carbon black may be incorporated by the lighter mixers, but requires the shear of the conventional types for good dispersion. It should also be possible to mix continuously by using an extruder-type mixer.

A major advantage in hard rubber compounding is the very little heat build-up during mixing. The power input is so low that heat is no problem, and considerable power savings are realized.

Stocks Are Powder Form

A Flosbrene stock after mixing forms a damp feeling powder rather than the conventional cohesive sheet. This powder lends itself well to automatic conveying, preweighing, and preforming operations. In this area lie some of the most interesting and useful properties of Flosbrene stocks.

Mold flow, particularly in not too highly loaded stocks, is excellent. By controlling viscosity by compounding, use of these hard rubber stocks for transfer or injection molding should be feasible.

Physical properties in equivalent formulations tend to be slightly lower than for solid types, but can be improved to roughly equal by proper compounding. Cure rates are about the same as for solid types. Since less process oil is required in most cases, cure rate of most Flosbrene stocks will be faster, and acceleration can be reduced.

It should be noted that the sulfur content should be raised 3 phr. in high-grade hard rubber stocks. The need of this addition is not so apparent in very highly loaded stocks which normally have a very high oil content.

The trade name Flosbrene, if you haven't already been able to guess, is made up from flo(w) plus SBR with the ene added to complete the name.

meetings and reports

Rubber Division, ACS,

Louisville Meeting Attracts 800; Winkelmann Receives Goodyear Medal

The seventy-ninth meeting of the Division of Rubber Chemistry of the American Chemical Society held in Louisville, Ky., at the Brown Hotel, from April 19 through 21, attracted an attendance of about 800, not including many ladies of the members and guests present. This meeting was featured by an invited paper by Dr. Henry Eyring, of the University of Utah, the Goodyear Medal Award Lecture by Dr. H. A. Winkelmann, Dryden Rubber Division, Sheller Mfg. Corp., and a fine program of about 20 other papers on a diversity of subjects. The heaviest concentration of papers was on the subject of new methods of testing, followed by papers on nitrile rubber and latex, polyurethanes, and neoprene, with papers on carbon black structure, the injection molding of silicone rubber, the ozone aging of neoprene, mechanized literature searching, and several other subjects rounding out the program.

At the business meeting of the Division, at which the nominations for new officers and directors were presented, A. W. Sloan, Atlantic Research Corp., and G. H. Swart, The General Tire & Rubber Co., were named as candidates for vice chairman. There were the usual meeting of the 25-Year Club attended by about 125 senior members of the Division and the banquet of the Division at which the Goodyear Medal Award ceremonies took place.

The local committee arranged for a program of plant visits on the afternoon of April 20 to the Du Pont neoprene plant, the General Electric Co., Brown-Forman Distillers Corp., or Brown & Williamson Tobacco Corp. A special program for the ladies included sightseeing trips to "My Old Kentucky Home" at Bardstown, Ky., a pottery works, and to General Electric's Appliance Park, where the ladies had an opportunity to see demonstrations of model kitchens.

Suppliers maintained the usual hospitality and technical assistance suites.

W. S. Coe, Division chairman, opening the first session on April 19

Technical Sessions

W. S. Coe, Naugatuck Chemical Division, United States Rubber Co., 1961 chairman of the Rubber Division, presided at the first technical session on the afternoon of April 19. Dr. Coe welcomed the members and guests to the seventy-ninth meeting of the Division and complimented the local arrangements committee for its efforts in connection with the meeting. A separate welcome was extended to those present by D. E. Andersen, E. I. du Pont de Nemours & Co., Inc., elastomer chemicals department, chairman of the local arrangements committee.

Dr. Coe then introduced Henry Eyring, dean of the Graduate School of the University of Utah, who presented an invited paper. The presentation of this special paper was a continuation of the practice instituted in 1960 by W. J. Sparks, Esso Research & Engineering Co., 1960 Division chairman, of fostering relations with academic workers on polymers and elastomers by inviting them to present papers on their work in the high polymer field.

"Thermodynamics and Transport Properties of Monomers and Polymers" was the title of Dr. Eyring's paper. An adequate theory of transport properties involves a satisfactory understanding of the structure and thermodynamic properties of liquids, it was said. The significant structure theory of liquids was developed for various types of simple molecules and calculated properties compared with experimental results. The Flory and Huggins treatment of the thermodynamics of polymers is a natural extension of the significant structure theory, and the entropy of the mixing of large molecules in solution was discussed in this connection. The extension of the significant structure theory to viscosity, diffusion, and thermal conductivity was also explained.

The reaction rate theory of viscosity was developed for high polymers. Particular account was taken of the kinetic segment of flow and of tangling segments. The results obtained for the viscosity of high polymers are in accord with experimental findings, Dr. Eyring said. He emphasized that a quantitative relation for the properties of high polymers in liquids had been developed; therefore a program and means for the continuation of further research and development work in this field were available.

"The Structure of Various Natural Rubbers," by F. W. Stavely, J. L. Binder, P. H. Biddison, M. J. Forster, and H. G. Dawson, Firestone Tire & Rubber Co., was the next paper on the program. Although the composition and structure of *Hevea brasiliensis*, gutta percha, and balata have been investigated by many methods including electron microscopy, X-ray diffraction, and infrared spectroscopy, the information on the less common rubbers is limited. Latex particle sizes and structure for such botanical species as *Castilla elastica, Funtumia elastica, Manihot glaziovii, Landolphia, Cryptostegia grandiflora,* and others from the U. S.

Department of Agriculture station at Cocoanut Grove, Fla., and elsewhere were given. It was shown that with the exception of gutta percha, balata, and chicle, all of these rubbers have the same microstructure as *Hevea*, and a *cis*-polyisoprene content between 97.0 and 97.8%. It was considered of great interest that so many unrelated plants have aqueous stereoregulating systems that generate polyisoprene of high *cis*-1,4 content, while no simple system has been found for the duplication of this stereosynthesis in aqueous media. Such an aqueous system for the synthesis of stereospecific polymers could be much cheaper than the present solvent systems, it was said.

"Biaxial Fatigue Testing of Vulcanizates" was the title of a paper by S. D. Gehman, P. Rohall, and D. I. Livingston, of The Goodyear Tire & Rubber Co. Dr. Gehman stated that rubber vulcanizates are strongest in the direction of stress and weaker in the transverse direction, and the rubber in tires may be subjected to forces from both directions. He presented the results of extensive fatigue tests on natural rubber and SBR vulcanizates carried out by alternate stretching of the specimens in two perpendicular directions. It was shown that the data can best be handled statistically by assuming a log-normal distribution or by the use of extreme probability techniques. Examples were given to show value of the method for determining fatigue life of different SBR's, effect of processing variables, effect of various loadings of different types of carbon blacks, and effect of antioxidants and antiozonants.

Exploratory tests using ozone instead of pinholes to initiate failure eliminated the wide range in fatigue life between NR and SBR and in this respect gave results more consistent with general service performance. This type of biaxial fatigue testing has many areas of usefulness for developing good endurance qualities in vulcanizates.

"Analysis of the Force-Depth Relation in the Penetration of Rubber Compounds" was the title of a paper by G. S. Yeh and D. I. Livingston, also with Goodyear, which reported on the results of an attempt to determine if a penetration-type test would be useful for measuring the quality of vulcanizates. The force-depth relation of the penetration data was analyzed, and a relation between penetration force and depth was found which had two regions of linearity in a log-log plot, up to puncture.

Twenty-two compounds, including vulcanizates of NR, SBR, and synthetic polyisoprene, were studied. The penetration force was found to be in direct proportion to Young's modulus in both regions of linearity. In the first region, in which the indentor penetrates into the rubber to a depth approximately equal to twice its diameter, Timoshenko's classical relation, $F = 2.67$ Erd, holds. In the second region, an empirically derived equation, $F = 1.34\ E\ r^{1/2}\ d^{3/2}$, holds. For a given rubber compound, Young's modulus calculated from the second equation is in satisfactory agreement with the modulus obtained from the first equation.

The relation of the puncture strength and puncture depth with such important variables as curing time, carbon black loadings, and the dose for irradiated stocks was shown. A correlation between road-wear rating of tires and puncture depth values on the stocks used was indicated.

Dr. Henry Eyring, University of Utah, delivering his invited paper on April 19

"The Measurement of Structure in Carbon Blacks" was the title of the paper by Andries Voet, W. N. Whitten, and A. C. Teter, J. M. Huber Corp. Carbon black structure is not a single property, but a complex phenomenon and may be evaluated in its various aspects by measurement of electrical properties of blacks dispersed in a fluid vehicle at varying rates of shear, it was said. Increase in electrical conductivity after shear is a measure of chain formation; increase in dielectric constant indicates growing anisometry (lack of symmetry) in agglomerates. Viscosity at low rates of shear is also indicative of structure. Dispersibility of the black is not significant in the above, contrary to oil absorption data.

A novel approach to structure has been developed in the determination of specific volume of a carbon black at high compression (10,000 psi.), which appears to correlate well with the structure in dispersions and the modulus in vulcanizates.

Illustrative data indicated results for commercial regular and low-structure blacks as well as for experimental very low-structure blacks.

"The Analysis of Pigment Dispersion in Rubber by Means of Light Microscopy, Microradiography, and Electron Microscopy" was given by W. M. Hess, Columbian Carbon Co. By freezing rubber specimens in liquid nitrogen, microtome sections from 40 microns to $\frac{1}{20}$-micron in thickness of NR, butyl rubber, SBR, polybutadiene, and silicone rubber were prepared. The dispersion of reinforcing pigments from coarse agglomerates down to the ultimate particle was studied.

Using special X-ray and electron microscope tensile specimen holders, rubber samples were studied under varying degrees of strain. It was emphasized that this type of analysis sometimes improved the interpretation of other test results and should provide a better basic understanding of reinforcement. Examples of the formation of vacuoles adjoining pigment agglomerates on stretching rubber samples were shown.

A moving picture of the tearing of a natural rubber vulcanizate reinforced with SRF carbon black vividly illustrated the resistance to tear provided by certain sections of the specimen in contrast to the quick tear of other sections.

W. J. Sparks, 1960 Rubber Division chairman, presided at the second technical session on the morning of April 20. The papers presented at this session were as follows:

"A Study of Ozone Resistance of Neoprene Vulcanizates" was by Peter Katsenis and E. G. Partridge, TLARGI Rubber Technology Foundation, University of Southern California. Neoprene vulcanizate ozone resistance factors were investigated under accelerated conditions by observing (1) time to first appearance of cracks in a stretched sample, (2) severity of cracking in a stretched sample, and (3) increase in length of samples on cracking under constant load. Dynamic tests were also run. No critical range of stress, strain, or ozone concentration was found. Ozone resistance decreased as elongation and ozone concentration increased; resistance decreased with increasing amounts of filler and increased with increasing amounts of antioxidants. Ozone resistance was influenced by sample surface conditions, cracks were initiated at imperfections. Dynamic tests emphasized difference between compounds not shown by static testing.

The effect of modulus on ozone cracking was studied by varying modulus by (1) blends of different carbon blacks with total loading held constant, and (2) by varying the accelerator level. Increased modulus by (1) decreased ozone resistance; increased

modulus by (2) increased ozone resistance. The increased ozone resistance with increased accelerator was considered to be due to either specific antiozonant properties in the accelerator used (2-mercaptoimidazoline - NA-22), or a higher degree of crosslinking. The effect of degree of crosslinking may be due, in turn, to the greater resistance of a structure with more crosslinks or reduction of active sites susceptible to ozone attack.

The results of this study should be of value in compounding neoprene for improved resistance to ozone. Work is being continued with different accelerator systems and with polymers with different numbers of active sites to clarify the understanding of the mechanism, the authors said.

"Protection of Neoprene Latex Films against Discoloration by Light" was the paper by R. O. Becker and R. L. Seligman, E. I. du Pont de Nemours & Co., elastomer chemicals department. The discoloration of films from Neoprene Latex Types 842A and 400 can be inhibited by use of a combination of a triglyceride of linoleic acid (safflower oil), 15 phr., and a hindered phenol-type antioxidant (2 phr.). The variables studied included the amount and type of fatty acid and/or its derivative, amount and type of antioxidant, filler loading, accelerators and commonly used stabilizers for vinyl resins. Exposure conditions were as follows: RS sunlamp, Weather-O-Meter (dry), outdoors, and indoors at a window facing south.

AgeRite Superlite gave the best results under the sunlamp; while Antioxidant 425 was best with natural light. Vinyl stabilizers were useful, but impractical because of effect on cure. Safflower oil reduced stress-strain properties somewhat, but resistance to heat, ozone, and low temperatures of safflower-containing neoprene vulcanizates was good.

"Protection of Neoprene Vulcanizates against Heat Aging" was authored by K. L. Seligman and P. A. Roussel, Du Pont. The resistance of neoprene vulcanizates toward accelerated heat aging is improved by compounding with high molecular weight aliphatic esters such as rapeseed and safflower oils. Best results were obtained with esters of low volatility and low unsaturation that remain unaltered in the neoprene compound. The stabilizing action is not considered to be antioxidant in character, but rather to be an interference with post-oxidative cross-linking which leads to polymer embrittlement. Gum, clay, and carbon black stocks were investigated.

"Differences between Butadiene-Copolymer Blends and Single Polymers" was the paper by Carl E. Fleming, B. F. Goodrich Chemical Co. Oil and fuel resistance of nitrile rubber has generally been considered a function of the amount of acrylonitrile present, regardless of how combined. It has been found, however, that blends made from polymers of widely different nitrile contents give oil and low-temperature resistances different from expected when copolymers of 20 to 48% nitrile content were blended in pairs to give an elastomer blend with 30% nitrile content. Swelling in oils of blends of identical nitrile content can be very different from one another; the magnitude of the difference is dependent on how close were the nitrile contents of the copolymers used to make the blends.

"Swelling Effects of Liquids on Nitrile Rubbers," by P. H. Starmer, C. H. Lufter, B. F. Goodrich Chemical Co., was next on the program. Relations have been found between the volume change of a rubber and some characteristic of the liquid such as chemical structure, aniline point, or solubility parameter, but certain limitations have restricted the full use of such relations. An alternate approach, to obtain correlation between the volume change given with a particular liquid and some property of the rubber was investigated.

For a range of nitrile rubbers the volume change in a liquid was plotted against the nitrile content of the rubber. For a particular liquid the points could be described by a Gaussian-type curve, and an attempt was made, therefore, to relate constants of the equation with the physical characteristics of the liquid. It is postulated that the nitrile content of the rubber which shows maximum swelling in a given liquid is related to the dielectric constant of that liquid, and the value of maximum swelling is a function of the absolute temperature and the molar volume of the liquid.

"Development and Application of a High Solids Nitrile Rubber Latex," by J. M. Mitchell, G. K. Watson, H. L. Williams, Polymer Corp., Ltd., followed on the program. Improved oil resistance of films from latices can be achieved by the use of a nitrile rubber latex. The further requirement of high solids content is critical in latex foam rubber applications. The "freeze-agglomeration" technique has been used successfully to produce a nitrile rubber latex with a solids content of more than 60% adequate for foam rubber compounding. This latex has an actual solids of 63.5%, a Brookfield viscosity of 10 poises, a pH of 10.5, and particles 1700 Angstrom units in diameter.

The effect of certain compounding variables such as zinc oxide and sulfur content on tensile, elongation, and compression set was described. Also, it was shown that the higher the bound styrene, the higher tensile strength and elongation of the rubber. Information was given also for the effect of a lubricating-type oil on such properties as tensile strength, elongation, compression modulus, and flex life of the foam rubber, both in unaged and aged conditions. Comparative data were shown for SBR, NR, and neoprene foam. In connection with the effect of inert fillers on the properties of the nitrile foam rubber it was shown that talc and clay had only a minor effect on tensile and elongation, but that mica had a much more pronounced effect. The NBR foam had a lower compression set even when oil soaked when compared with neoprene and urethane rubber foams.

The use of NBR latex foam rubber in journal lubricating devices for railway freight cars was reviewed in relation to known requirements for this application.

George E. Popp, Division vice chairman, presided at the third and final technical session on the morning of April 21. The papers presented at this session were as follows:

"Urethane and Urethane-Urea Elastomers Prepared by a One-Shot Method," by S. L. Axelrood, C. W. Hamilton, K. C. Frisch, Wyanadotte Chemicals Corp., was the first paper at this session. One-shot urethane and urethane-urea elastomers based on polyether polyols, tolylene diisocyanate, and hindered aromatic amines (the latter for urethane-urea polymers only) have been developed utilizing metal salts such as stannous octoate and lead naphthenate as catalysts to provide for rapid buildup of the polymer containing suitably space crosslinks. With the urethane-urea elastomers it is especially important to balance the isocyanate-diamine and isocyanate-hydroxyl reaction rates by proper catalysis to obtain polymers with desirable combination of properties.

Effects of type and amount of catalyst average equivalent weight of polyether polyol used, the ratio and distribution of urethane and urea groups, and cross-link densities were determined by statistically designed experiments. For urethane-urea elastomers, the type of diamine used (4,4'-methylene-bis-(chloroaniline) and 3,3'-dichlorobenzidine) was investigated. The results of a study of curing conditions for a practical cure cycle with minimum molding time were presented.

One-shot urethane and urethane-urea elastomers were shown to have similar physical properties to those made by the prepolymer route. It was emphasized that one-shot casting allowed the preparation of elastomers directly from the starting raw materials in a shorter time than by the prepolymer method, and the former appears to have economic advantages.

"New Techniques in Processing Urethane Elastomers," by K. A. Pigott, J. W. Britain, W. Archer, B. F. Frey, R. J. Cote, J. H. Saunders, Mobay Chemical Co., pointed out that liquid casting systems for urethane elastomers introduced in 1955 have been hampered in

commercial utilization by long mold cycles. Mass production requires a less expensive fabrication system.

With raw materials similar to those used in the polyester casting system, a new process has been developed to give a semi-cured product (Texins) which can be processed by extrusion, injection molding, transfer molding, blow and compression molding. Many of the ultimate properties can be obtained without additional cure, but an oven cure gives products with low set and the best solvent resistance.

Polyester urethane elastomers in a hardness range from Shore A of 60 to Shore D of 70 can be made, although elastomers with a Shore A of 80 and 92 are the only ones available commercially at present. Abrasion resistance, ozone resistance, high tensile and tear properties with these new elastomers are equivalent to those obtained by the casting technique. Orientation of fiber and film give tensile strengths up to 30,000 psi.

It was explained that the Texins should be processed at as low a temperature as is feasible. Extrusion should be done at temperatures between 300 and 350° F., and calendering with roll surface temperatures of 300° F. A 10-second cycle has been used in injection molding, and one- to two-minute cycles in transfer molding. With compression and transfer molding, removal of the parts should be at 250° F. or lower in order to avoid damage of the parts.

The new process should promote application of urethanes by processes and equipment familar to the rubber industry, which means that large quantities of parts at low cost can be produced, thus making urethanes more attractive to the elastomer producer and user, it was said.

"Machine Literature Searching with the IBM-101," by L. E. Straka, Goodyear, emphasized at the outset that up to 45% of research and development work may be a repetition of work already done because it was not preceded by a proper search of the literature. Since about six million pages of technical articles were published in 1960, literature searching requires the use of the latest automated techniques wherever possible.

Mechanized information retrieval with the IBM-101 electronic statistical machine based upon superimposed random number coding has been initiated in the Research Library of the Goodyear Company. The system involves: (1) subject analysis, (2) code assignment, (3) card punching, and (4) machine retrieval. Coding for rubber and plastics is a major problem, and Goodyear has developed its own dictionary of key words to random number codes. The analysis of the articles and the coding are the most expensive part of the operation.

Subject and author fields can be searched for as many as six variables in one pass of the cards at 450 per minute. Card design permits incorporation of source information, author, title, and up to 25 key words.

Dr. Straka recommended that the Rubber Division give consideration to the establishment of machine literature searching at the Division Library at the University of Akron on a subscription basis for the entire rubber industry. The cost for the rental of the IBM-101 machine, punch, and the automatic typewriter amounts to $430 per month.

"Injection Molding of Silicone Rubbers," by R. P. DeSieno, General Electric Co., and R. Fuhrman, Lewis Welding & Engineering Co., came next on the program. Relatively soft and plastic unvulcanized silicone rubber compounds lend themselves to the high pressure (12,000 psi.) and high-speed flow necessary for the success of injection molding with potential for economies of raw material consumption and rate of fabrication, while at the same time enhancing the physical profile of silicone rubber and providing greater reproducibility of fabrication.

Achievements with GE-grade silicone rubbers SE-452 and SE-555 on Lewis Welding & Engineering equipment were reported as follows: (1) molding cycles of 60 to 90 seconds, with physical properties superior to those established in 15- to 20-minute compression molding operations; (2) physical profile of injection molded products exceeding those of postbaked compression molded formulations, with tensile, elongation, and tear strength enhanced; (3) only 25 to 50% of the peroxide catalyst [dicumyl peroxide, ditertiary butyl peroxide, or 2,5 bis (t-butyl peroxy) 2,5 dimethyl hexane] required for compression molding is necessary for injection molding; (4) compression set of injection molded compounds reduced by as much as 25% from normal values; (5) thick section molding and effective deep section cures established. Injection molded shrinkage values may be 1% to 1.5% higher than for compression molding.

The work reported in this paper indicated that silicone rubber is well suited to injection molding. Not only are the physical properties of the material improved by injection molding, but the fabricator saves processing time through reduced molding cycles while the application of increased automation and the production of more uniform parts provide further advantages.

D. E. Andersen, chairman of the local committee for the Louisville Rubber Division meeting

Some of the Division officers at Louisville, *left to right:* George Hackim, Jr., assistant treasurer; D. F. Behney, treasurer; G. E. Popp, vice chairman; L. H. Howland, secretary; G. N. Vacca, assistant secretary

"Determination of Nonylphenyl Phosphite in SBR Latex and Polymer by a Direct UV Spectrophotometric Method," by H. J. Brandt, U. S. Rubber presented a direct spectrophotometric method for the determination of Polygard (a mixture of nonylated phenyl phosphites), specific for phenolic compounds. The method eliminates the need of perchloric acid destruction of organic matter and background correction factors. Extraction from sheet rubber is speeded up by use of an ultrasonic generator.

"Antioxidant Efficiency of p-Phenylenediamines in Natural Rubber Vulcanizates," by O. Lorenz and C. R.

Some well-known personalities of the Rubber Division by Kaliff at Louisville. (Courtesy St. Joseph Lead Co.)
Left to right: W. J. Sparks, Frank Smith, Louis Howland, A. E. Juve, and J. M. Ball

Parks, Goodyear, followed. The kinetics of the consumption of various p-phenylenediamines during oxidation of NR vulcanizates was investigated between 80 and 120° C. by the oxygen absorption method. N, N′ di- (1-methylheptyl)-p-phenylenediamine, DMHPD (Flexzone C); N-isopropyl-N′-diphenyl-p-phenylenediamine, IPPD (UOP 288); and N, N′ - diphenyl - p - phenylenediamine, DPPD (Wingstay 100) were used to follow the oxidation.

It was found that DMHPD and IPPD were consumed by direct, relatively fast reaction with oxygen which was of the first order with respect to diamine; DMHPD was oxidized faster than IPPD; the rate constants differ by a factor of four at 100° C. The oxidation products formed exhibited antioxidant activity although the activity of the DMHPD oxidation products was only moderate.

Diaryl-p-phenylenediamines were consumed by a rather slow zero order reaction. In most cases the oxygen absorption curves consisted of only two stages, a constant rate and an autocatalytic stage. During the constant rate period, five to six molecules of oxygen were absorbed per molecule of diamine consumed. The length of the constant rate stage was found to be twice the length of the time needed to consume the diamine, indicating that its reaction product also possessed antioxidant activity. Increasing the initial diamine concentration showed that the constant rate stage passed through a minimum and then slowly increased linearly, indicating that the direct oxidation of the diaryl diamines is only a minor side reaction.

"The Static U-Adhesion and Dynamic Strip Adhesion Methods for Tire Cord Adhesion Testing," was by W. H. Nicol and D. D. Ray, Goodyear. In the U-Adhesion test a rubber bar is cured in a removable insert mold so that both ends of a cord loop are embedded in the rubber, and the force on the loop to pull either cord end from the rubber is a measure of the adhesion. After cure, the assembly is fitted into a heated chamber on a tensile machine, thus allowing the test to be run very simply at elevated temperatures. Owing to sample design, a high level of cord adhesion may be measured without cord failure. The U-adhesion test is well adapted to rapid screening of compounding variables since calendered or milled sheets may be used as samples.

The dynamic strip adhesion test, suitable for control testing of calendered fabric in the form it is used in tires, measures the separation rate between plies of rubber-fabric laminate subject to a dynamic peeling force at elevated temperature. Single cords may be tested after conversion to fabric with simple drum building equipment. The failed sample readily shows the weak layer in the rubber-adhesive-fabric system. The severity of the test may be modified by changing the separating force.

The U-adhesion test is being submitted to the American Society for Testing Materials for adoption as a standard test method to replace the so-called H-test. The dynamic strip adhesion test is also being submitted to ASTM for consideration.

"Some New Interpretations of the Tire Cord Fatigue Phenomenon" was the title of the paper by W. G. Klein, W. J. Hamburger, M. M. Platt, Fabric Research Laboratories. Tyrex and nylon tires cord fatigue were studied in fleet tests using manufacturers' rated pressure and loading and in fleet tests using severe high-speed, low-pressure, overload conditions. Cords were extracted from tires in both studies and in many cases filaments extracted from cords. Both conditions of use result in normal initial cord strength loss at early mileages followed by a long period of almost constant cord strength at about 80% of the original. It was concluded that cord failure must be sudden and "cataclysmic" since it was not preceded by any gradual weakening of the cord and that the mechanism was probably a gradual breakdown in adhesion between cord and rubber. This loss of adhesion was shown to be greatest in the zone of greatest flexing in the tire and with underinflation was greatest in the sidewall area.

Some work was done on the gross mechanisms involved in laboratory fatigue testers such as the Goodyear and Firestone machines and the relations of these mechanisms to fiber properties and bond characteristics.

"Tubeless Tire Performance Related to Inner Liner Properties," by R. H. Dudley, J. V. Fusco, Enjay Laboratories. Measurements of air pressure within the plies of tubeless SBR tires showed that those with chlorobutyl liners developed substantially less interply pressure than those with liners of unsaturated-type rubbers. In laboratory permeability tests, chlorobutyl inner liners showed only about one-third as much air permeation as unsaturated rubber inner liners over a broad range of test temperatures. There was little change in permeability on aging three weeks at 200° F.

In passenger-car tire road tests, chlorobutyl inner liners in SBR tubeless nylon tires decreased air loss, reduced severity and frequency of blowouts which occurred in tires with SBR-NR inner liners, and tires with chlorobutyl inner liners showed improved tread wear pattern with less tread loss in the outer ribs.

In his remarks at the end of the final session Vice Chairman Popp expressed special appreciation to J. J. Blau and M. D. Livingood, both of Du Pont, for their fine work in arranging for the meeting rooms and following through on the details of slide projection, etc., which had done much to make the presentation of the papers at the Louisville meeting outstandingly successful.

The Goodyear Lecture

"Coatings for Rubber" was the title of the Goodyear Medal Award Lecture given by H. A. Winkelmann, Dryden Rubber Division, Sheller Mfg. Corp., on

H. A. Winkelmann presenting memento to C. R. Johnson for 50 years in the rubber industry, at 25-Year Club meeting

the morning of April 20. Dr. Winkelmann expressed his appreciation of being selected as the Goodyear Medal recipient for 1961 and said he accepted the award with humility. He then thanked his associates and friends for their encouragement and counsel over the years and indicated some of them by name.

Dr. Winkelmann described a solvent-type polyurethane coating system for rubber which broadens the field of application of rubber parts since the polyurethane may be applied in bright colors and in the form of simulated chrome or bronze finishes, the latter not previously having been available for rubber. These polyurethane coatings have been applied most successfully to automotive door and window weather strips where fabric-wrapped or fabric-flocked rubber weatherstrips were never completely satisfactory.

These new coatings for automotive weatherstrips have a satin-like finish with low surface friction, good abrasion resistance, good adhesion to the base rubber under adverse moisture, temperature and flexing conditions, good resistance to solvents, oils, and ozone, and they also retain their color fastness on outdoor exposure.

Before the coating is applied, the rubber part is chemically cleaned to remove soluble or loosely held surface contamination and to assure maximum adhesion of the coating. The coating will adhere to natural rubber, SBR, neoprene, nitrile, and butyl rubbers and to the copolymer of hexafluoropropylene and vinylidene fluoride ("Viton" A). Application is by either manual or automatic spraying to an optimum thickness between 0.00059- and 0.0020-inch. Optimum curing conditions for the coatings are 30 minutes at 265° F. Adhesion improves on standing and should not be tested until at least five days after the application of the coating.

The Medalist showed samples of several types of automotive weatherstripping to which the coatings had been applied and explained that a large amount of development work had been required to perfect this new coating system to meet the wide variety of service conditions encountered. He said that much work remains to be done because of the new problems that arise with each new application and emphasized that in use the better the production control the higher the quality of the coated product.

The Business Meeting

Vice Chairman George E. Popp presided at the Division's business meeting on the morning of April 20. He announced that the registration at that time for the Louisville meeting amounted to 775.

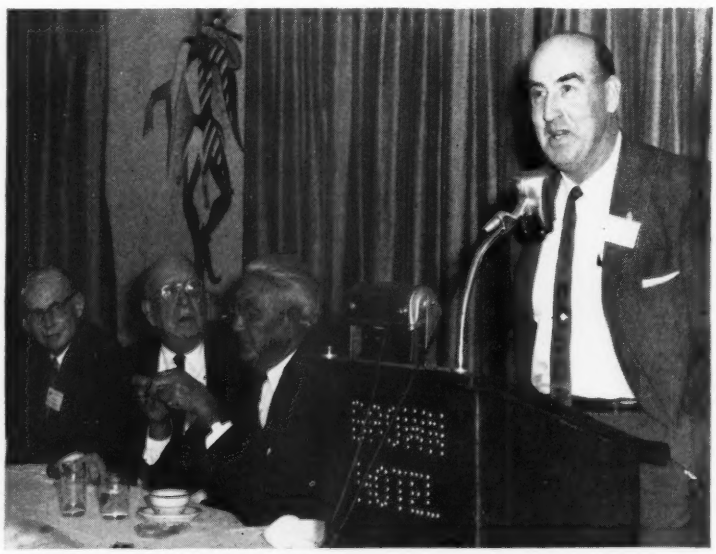
The Award for the Best Paper presented before the Division at its meeting in New York in September, 1960, was made to Robert M. Murray and J. Donald Detenber, both of the Du Pont elastomer chemicals department, for their paper, "A Study of First- and Second-Order Transitions in Neoprene."

The nominations for officers and directors from the areas of several of the local rubber groups were announced by J. D'Ianni, Goodyear, for L. M. Baker, General Tire, chairman of the nominating committee. The nominations for officers were as follows: For chairman, George E. Popp, Phillips Chemical Co.; vice chairman, A. W. Sloan, Atlantic Research Corp., and G. H. Swart, General Tire & Rubber Co.; secretary, L. H. Howland, Naugatuck Chemical Division, U. S. Rubber; and treasurer, D. F. Behney, Harwick Standard Chemical Co. Nominations for directors were: Washington, John R. Britt, B. F. Goodrich Co., and Lawrence A. Wood, National Bureau of Standards; Connecticut, Vincent P. Chadwick, Armstrong Rubber Co., and Harry Gordon, Bond Rubber Corp.; Southern Rubber Group, John Bolt, Naugatuck Chemical, and Allen B. Craig, Jr., Witco Chemical Co.; Fort Wayne, Balfour Connell, General Tire, and Robert L. Blair, Atlantic India Rubber Works and Mogul Rubber Corp.; Chicago, Yale Karmell, S. Bingham Mfg. Co., A. G. Cobbe, Cabot Corp., and A. L. Robinson, Harwick Standard. The election will be by letter-ballot before the fall meeting of the Division.

Secretary Howland announced four new emeritus members of the Division in W. E. Glancy, F. L. Holbrook, J. J. Rankin, and A. O. Zimmerman. He urged that those eligible for emeritus status notify the treasurer since otherwise their eligibility might not be known. Upon reaching age 65, a member automatically achieves emeritus status.

A moment of silence was observed in memory of the following members whose deaths occurred since the last meeting of the Division: E. I. Ramaga, J. M. Huber Corp.; C. A. Bartle, retired; N. W. Hess, Stowe-Woodward, Inc.; G. L. Allison, consultant; C. R. Haynes, National Polychemicals, Inc.; Jonas Kamlet, the Kamlet Labs; K. C. Crouse, Sr., J. M. Huber Corp.; C. A. Hemingway, Westwood Chemicals; H. L. Fisher, retired; and J. D. Gaffen, Holtite Mfg. Co. and Cat's Paw Rubber Co.

E. V. Osberg, National Polychemicals, presented resolutions to record the deep regret of the Division on the loss of Charles R. Haynes, Division secretary for many years, and Harry



H. O. George, chairman for the Louisville meeting of the 25-Year Club; with (*left to right*) R. G. Seaman, W. Welch, and W. O. Hamister

L. Fisher, Division chairman in 1928, Goodyear Medalist in 1949, and president of the parent Society in 1954. These resolutions were approved unanimously by the membership.

At the conclusion of the business meeting Vice Chairman Popp reminded the members of the next meeting of the Division scheduled for Chicago, Ill., September 5-8, at the Hotel Sherman.

25-Year Club Meeting

About 125 members of the Division's 25-Year Club met in the South Room of the Brown Hotel at noon on April 19 for the twenty-sixth meeting of that organization. H. O. George, American Synthetic Rubber Corp., was the chairman for the Louisville meeting of the Club and first extended a welcome to those present.

A moment of silence was observed in memory of the following members who had passed on since the last meeting: Donald F. Fraser, Garlock, Inc.; C. A. Bartle; G. R. Allison; R. H. Wattleworth, B. F. Goodrich; C. R. Haynes; H. L. Fisher; C. A. Hemingway; and W. B. Brewer, Cooper Tire & Rubber Co.

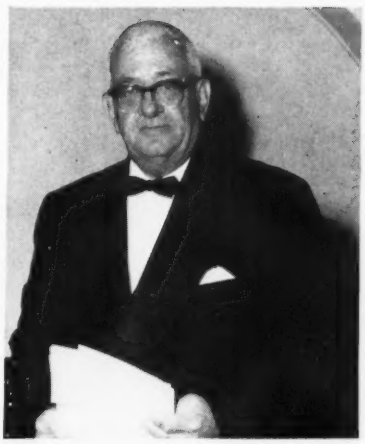
About ten new members of the Club were asked to stand and be recognized; then the meeting was turned over to H. A. Winkelmann for the determination of the member present with longest period of service in the rubber industry who had not previously been so honored. The honor at the Louisville meeting went to C. R. Johnson, Spencer Products Co., with 50 years of service in the industry, and a suitable memento of the occasion was presented to him by Dr. Winkelmann.

In concluding the meeting, the new members were advised that they could obtain their 25-Year Club pins from Owen Brown, Jr., of Cabot Corp.

The Division Banquet

The banquet of the Rubber Division held in the Flag Room of the Kentucky Hotel was preceded as usual by the suppliers' cocktail party and a special reception for those seated at the head table. About 500 members and guests were present at the banquet, including many of the wives of those attending the meeting.

Vice Chairman Popp presided in the absence of Chairman Coe who sent his regrets for having to leave the meeting early because of company business. Mr. Popp expressed his pleasure at visiting Louisville and the State of Kentucky in connection with the division meeting. He then introduced the officers, directors, and distinguished guests seated at the head table and also recognized the ladies of those at the head table, especially Mrs. H. A. Winkelmann, the wife of the 1961 Goodyear Medalist. Recognition was also extended to the editors of *Rubber Age* and RUBBER WORLD for their cooperation and help in connection with Division activities.



Charles M. Baldwin, biographer for the Medalist

The chairman of the local arrangements committee, D. E. Andersen, Du Pont, and the chairman of the various subcommittees of the local committee were next introduced, and the appreciation of the officers and directors of the Division was extended to them for their fine work for the Louisville meeting. These chairman included: C. Baldwin, United Carbon, suppliers' cocktail party; R. S. Barrows, Du Pont, plant trips; J. J. Blau, Du Pont, program and rooms; S. S. Brandt, Du Pont, banquet; R. W. Finholt, General Electric, ladies' entertainment; M. Glock, B. F. Goodrich Chemical, advisor; A. R. Rice, Du Pont, publicity; R. M. Sluyter, Goodrich Chemical, finance; D. N. Sukow, American Synthetic Rubber Corp., housing; R. O. Stucker, ASRC, registration; F. C. Wagner, Du Pont, advisor; and I. G. Weedman, banquet.

D. E. Andersen assumed for the occasion the title of Lt. Governor of Kentucky in the absence of Lt. Governor Wilson W. Wyatt, in order to present in absentia a Kentucky Colonelcy to Division Chairman W. S. Coe. Vice chairman Popp accepted the Colonelcy for Dr. Coe.

Ron M. Warren, membership secretary of the parent Society, and representing the Society at the Rubber Division meeting, was introduced to the members and guests at the banquet.

In connection with the Goodyear Medal Award ceremonies Vice Chairman Popp introduced Charles M. Baldwin, United Carbon, the biographer for the Medalist. Mr. Baldwin said that he first came to know Dr. Winkelmann in 1937 and that he had always found him most cooperative and willing to give freely of his knowledge and experience to help others in the industry. Dr. Winkelmann's education, culminating with his receiving his Ph.D. from the University of Illinois in 1919, was described and his industrial experience with Goodrich, the Philadelphia Rubber Works, the Palmer Gas Products Co., and Marbon Corp., before joining the Dryden Rubber Division of Sheller Mfg. Corp., was recounted.

Dr. Winkelmann's many contributions to the chemistry and technology of rubber were explained in some detail. Mr. Baldwin made special mention of the Medalist's efforts in 1941 in reorganizing the Chicago Rubber Group and of his activities as former chairman of the Technical Committee on Automotive Rubber of the Society of Automotive Engineers and the American Society for Testing Materials. (Complete details of Dr. Winkelmann's career are found in a separate story given below. EDITOR.)

Dr. Sparks as chairman of the Goodyear Medal Award Committee then presented Dr. Winkelmann to Mr. Popp, who then presented Dr. Winkelmann with the Goodyear Medal, the certificate, and the honorarium. Dr. Winkelmann expressed his heartfelt thanks to the Committee for selecting him for the Division's highest honor, the Goodyear Medal.

The banquet program was then concluded with an outstanding entertainment program of variety acts featuring Johnnie Matson, Mona McCall, Marlene Fields, and the Four Step Brothers.

1961 Goodyear Medalist

Herbert A. Winkelmann, co-inventor of the first commercial antioxidant for rubber, was awarded the Charles Goodyear Medal of the Division of Rubber Chemistry, American Chemical Society, April 20, in Louisville, Ky.

Dr. Winkelmann, vice president and technical director of the Dryden Rubber Division, Sheller Mfg. Corp., Chicago, Ill., is holder or coholder of 48 patents in the field of rubber technology. One of his most recent developments is a coating for dense and sponge rubber that practically eliminates fabric cover and flocking of weatherstrips for current-model automobiles.

The gold medal was presented at a banquet which highlighted the division's seventy-ninth meeting. The presentation was made by William J. Sparks, 1960 chairman of the ACS Division of Rubber Chemistry. C. M. Baldwin, Chicago district manager for United Carbon Co., Inc., New York, N. Y., and long-standing associate of Dr. Winkelmann, gave a biographical introduction

H. A. Winkelmann receiving Certificate of Award of the Charles Goodyear Medal from G. E. Popp, Division vice chairman; W. S. Sparks, chairman of Goodyear Medal Award Committee, on right

of the award winner. He said:

"The amount of time, education and experience Dr. Winkelmann has contributed to rubber compounding has made his name virtually a household word in the rubber industry."

Dr. Winkelmann's career began in 1917 when he served for two years as captain in the Chemical Warfare Service. He then joined The B. F. Goodrich Co., Akron, O., as a research chemist, becoming technical superintendent of the tire division in 1924. In 1926 he was made chief chemist of the Philadelphia Rubber Works. Next he went on to the chemical laboratories of the Palmer Gas Products Co., one of the early producers of carbon black, and the Palmer sales agents, Herron & Meyer. Four years later the Medalist became chemical consultant to the Borg-Warner Corp. and vice president of its subsidiary, The Marbon Corp.

Dr. Winkelmann has written articles on antioxidants, accelerators, reclaimed rubber, rubber derivatives, and plastics; has lectured on synthetic rubber at the Illinois Institute of Technology and the University of Notre Dame; has served as vice chairman on the technical committee of Kentucky Copolymer Corp.; and presently is rubber consultant of technical command, Army Chemical Center, and chairman of classification and specifications of automotive rubber compounds of the Society of Automotive Engineers and the American Society for Testing Materials.

Last January, Dr. Winkelmann received the Certificate of Appreciation from the SAE for his contribution to rubber chemistry as related to the automotive industry.

The Charles Goodyear Medal, given annually for outstanding contributions to rubber chemistry, was first presented in 1941 to David Spence for his work on the growth and production of rubber from the guayule shrub. Recent recipients of the medal include:

1960—W. B. Wiegand, retired vice president in charge of research of Columbian Carbon Co., New York, N. Y., for showing the relations between surface of a filler and its reinforcing effect.

1959—Fernley H. Banbury, consultant for Farrel-Birmingham Co., Inc., for the invention, development, and commercializing of the Banbury internal mixing machine.

1958—Joseph C. Patrick, discoverer and pioneer in the production of Thiokol synthetic rubber.

1957—Arthur Whiting Carpenter, manager of testing laboratories of The B. F. Goodrich Co., Akron, O., until his retirement in 1955, for contributions to the field of physical testing.

Gordon Research Conferences

The Gordon Research Conferences for 1961 will be held from June 12 to September 1 at Colby Junior College, New London; New Hampton School, New Hampton; Kimball Union Academy, Meriden; and Tilton School, Tilton, all in N. H.

These conferences were established to stimulate research in universities, research foundations, and industrial laboratories. They consist of scheduled lectures and discussion groups. The meeting for a particular branch of research runs for a week from Monday to Friday. Requests for attendance or other information should be addressed to the Conference Director, W. George Parks, University of Rhode Island, Kingston, R. I.

Two conferences of major interest to RUBBER WORLD readers are the session on polymers to be held the week of July 3-7 and the elastomers conference scheduled for the week of July 17-21. Both of these sessions will take place at Colby Junior College. L. A. Wall, National Bureau of Standards, Washington, D. C., will serve as chairman of the Polymers Conference; while F. H. Winslow, Bell Telephone Laboratories, Murray Hill, N. J., will be vice chairman. Gerard Kraus, Phillips Refining Co., Bartlesville, Okla., will be chairman of the Elastomers Conference, and Henry Peters, Bell Labs., will serve as vice chairman.

The program of these conferences follow:

Polymers Conference

July 3. **"Progress in Polymer Research,"** H. Mark, Polytechnic Institute of Brooklyn, Brooklyn, N. Y.; **"Factors Involved in Rate Coefficients in Free Radical Polymerization,"** C. R. Patrick, The University, Birmingham, England; **"Reactivities of Fluoro-Olefins,"** M. Szwarc, State University College of Forestry, Syracuse, N. Y.; **"Kinetics and Mechanism of Fluoronitroso Polymerization,"** G. H. Crawford, D. E. Rice, B. F. Landrum, Minnesota Mining & Mfg. Co., St. Paul, Minn.

July 4. **"Polyphenylene Oxide Polymers,"** C. C. Price, University of Pennsylvania, Philadelphia, Pa.; **"Synergistic Agents for Self-Extinguishing Polystyrene,"** J. Eichhorn, Dow Chemical Co., Midland, Mich.; **"Kinetics of Ethylene-Propylene Copolymerization,"** H. M. Spurlin, C. A. Lukach, D. L. Christman, Hercules Powder Co., Wilmington, Del.

July 5. **"Temperature Dependence of Dynamic Mechanical Properties of Mixed Polymer Systems,"** A. D. McIntyre, Shell Chemical Co., Torrance, Calif.; **"Crystallizable Stereoblock Rubbery Copolymers of Olefins,"** E. G. Kontos, Naugatuck Chemical Division, United States Rubber Co., Naugatuck, Conn.; **"Sequence Relations in Copolymers,"** R. Simha, University of Southern California, Los Angeles, Calif.; **"Intramolecular Cyclization of Network Polymers,"** H. A. Hartung, Union Carbide Corp., Tonawanda, N. Y.

July 6. **"The Permeation of Water through Polymer Films,"** V. Stannett, State University College of Forestry, Syracuse; **"Thermal Degradation of Polypropylene,"** T. E. Davis, Dow Chemical, Pittsburg, Calif.; **"Some Kinetic Features of Graft Copolymerization with Special Reference to Radiation Grafting,"** A. Chapiro, Laboratoire de Chimie des Radiations, C.N.R.S., Bellvue (S. et O.), France.

July 7. **"Recent Advances in Block Copolymerization Initiated by Electron Transfer to Monomer,"** P. Sigwalt, Laboratoire de Chimie Macromoleculaire, Faculte des Sciences des Paris, Paris, France.

Elastomers Conference

July 17. **"Tensile Properties of Elastomers,"** F. Bueche, University of Wyoming, Laramie, Wyo.; **"Application of Finite Elastic Theory to the Deformation and Fracture of Rubbery Materials,"** P. J. Blatz, California Institute of Technology, Pasadena, Calif.; **"Crystalline and Amorphous Copolymers of Olefins,"** Gerhard Bier, Farbwerke Hoechst AG, Frankfurt (M)-Hochst, Germany.

July 18. **"Unsaturated Ethylene/-Propylene Terpolymers,"** R. T. Woodhams, S. Adamek, Dunlop Research Center, Toronto, Ont., Canada; **"Viscoelastic Properties of Polyolefin Elastomers,"** C. A. Dahlquist, P. W. Trott, R. B. Althouse, Minnesota Mining; **"Molecular Structure of Polybutadienes and Ethylene/Propylene Copolymers,"** H. J. Cantow, Chemische Werke Huls AG, Marl, Germany.

July 19. **"Chemistry of Elastomer Oxidation,"** E. M. Bevilacqua, U. S. Rubber, Wayne, N. J.; **"The Mechanics of Ozone Cracking of Rubbers,"** A. N. Gent, University of Akron, Akron, O.; **"The Study of Elastomers by Nuclear Magnetic Resonance,"** W. P. Slichter, Bell Labs.

July 20. **"The Conformation of Alkyl and Halogen Substituted 1,3-Butadienes,"** David Craig, B. F. Goodrich Co., Brecksville, O., J. J. Shipman, Goodrich, Akron; **"Tetrahydrofuran Polymerization Mechanism and Elastomeric Properties,"** C. E. Snyder, J. A. Lovell, Goodyear Tire & Rubber Co., Akron; **"A New Hydrocarbon Elastomer,"** E. K. Gladding, E. I. du Pont de Nemours & Co., Inc., Wilmington.

July 21. **"The Role of N,4-Dinitroso-N-Methylaniline in the Promotion of Rubber-Carbon Black Interaction,"** L. A. Walker, Monsanto Chemical Co., Nitro, W. Va.; **"Reactions of Isoparaffins with Sulfur and Di-t-Butyl Peroxide,"** P. E. Wei, G. G. Wanless, John Rehner, Jr., Esso Research & Engineering Co., Linden, N. J.

Akron Rubber Group Features Symposium On Reclaimed Rubber; and Talk on Space

The history of reclaimed rubber and its use in mechanical rubber goods and in tires and tubes were discussed at a symposium held at the spring meeting of the Akron Rubber Group, April 6. Approximately 400 persons attended the symposium, held at the Sheraton-Mayflower Hotel, Akron, O., and 474 attended the dinner following, at which Daniel Q. Posin, professor of physics at DePaul University, talked on "The Age of Space."

Panelists were Donald L. McCollum, production manager of Naugatuck Chemical Division, United States Rubber Co., who talked on "Reclaimed Rubber, Past, Present and Future"; John E. Brothers, chief chemist, Ohio Rubber Co., who discussed "Reclaimed Rubber in Mechanical Rubber Goods"; and Kenneth E. Garvick, manager of development, Mansfield Tire & Rubber Co., who spoke on "Reclaimed Rubber in Pneumatic Tires and Tubes." L. M. Baker, factory manager of the Akron plant of General Tire & Rubber Co., was moderator; D. M. Strasser, Witco Chemical, introduced the speakers.

McCollum explained that reclaimed rubber was originally developed because of a shortage of crude rubber, and reclaim was used for the same products as the original rubber, tire reclaim for tires, shoe heel reclaim for heels, and so on. It was not until the period between the end of World War I and the end of World War II that reclaim was made to specifications for use as a compounding ingredient. During World War II, with natural rubber short and synthetic rubber just beginning to be manufactured, tires were often made of 100% reclaim rubber.

In spite of rapid development of synthetic rubber, 625 million pounds of reclaim were consumed in the United States last year because of low price, processing advantages, and unique properties as a compounding ingredient, he said. McCollum also noted that the Reclaimator and Banbury processes have joined the older pan and digester processes as the major ones for producing reclaimed rubber today.

Brothers said that with the advent of extended rubbers, the savings in cost are no longer a major item in use of reclaim. In making automobile mats, reclaimed rubber shows less shrinkage and improved dimensional stability, with a shorter Banbury mixing cycle and less critical calender temperatures, in addition to much faster calendering speeds, he explained. A calendered stock that has 50% reclaim will mold with two to three times the amount of cured scrap as a stock with 100% reclaim, and on heavy-gage stock his company has not yet developed techniques allowing them to calender stock made from 100% new rubber, he declared.

On semi-pneumatic tires, a compound using new rubber costs less than a compound with a high percentage of reclaim, but the reclaim gives a lower Banbury cycle, less milling time, far less cured scrap, and less difficulty in splicing. On other items there is a shorter curing time with less accelerators, zinc oxide, and antioxidants.

Garvick presented a detailed breakdown of tire compounding with reclaim, noting that it gives reduced mixing time, lower power cost, better processing, better molding, faster rate of cure, and lower volume cost.

Panelists who discussed reclaimed rubber at the spring meeting of the Akron Rubber Group look over an exhibit set up in connection with the program. Observers, *left to right*, are K. R. Garvick, D. L. McCollum, D. M. Strasser, L. M. Baker, and J. E. Brothers

NYRG Hears Papers on Butyl Aging, Antiozonant Use, and NR Developments

About 250 were present at the afternoon technical program of the New York Rubber Group meeting held March 24 at the Henry Hudson Hotel, New York, N. Y.; while 190 stayed for dinner and the entertainment program which followed.

At the beginning of the afternoon session Group Chairman Henry J. Peters, Bell Telephone Laboratories, announced that the first recipient of the New York Rubber Group Scholarship at the University of Akron is Lloyd Shepherd, a resident of Akron and a graduate of Akron Central High School, with an excellent scholastic record. Mr. Shepherd will receive this $500-a-year scholarship at the beginning of his junior year in September. He is a chemistry major and active at the University in the Student and Inter-fraternity Councils, the Student Leadership Club, and on the campus newspaper.

"Resistance to Degradation in the Butyl Network," by Peter B. Lumb, of Polymer Corp., Ltd., was the first paper on the afternoon technical program. Dr. Lumb showed that by means of network density measurements, it had been found that the resistance of sulfur and quinoid cured butyl rubber to degradation on aging in air increases rapidly with increasing polymer unsaturation. This action is attributed to an increase in the rate of oxidative crosslinking relative to the rate of scission. Resin-cured vulcanizates do not show this dependence, however, and it was postulated that the resin functions as an antioxidant as well as a crosslinking agent.

The vulcanizates are almost completely stable in water at 177° C., showing that hydrolytic scission does not occur and that thermal degradation is negligible, at this temperature. Simultaneous exposure to air and water results in a rapid degradation at the surface, it was said. Data were shown for various resin-curing systems to illustrate the influence of non-butyl ingredients on the air aging, water absorption, and surface degradation of these vulcanizates.

"Additional Studies on the Application of Antiozonants in Rubbers," by H. E. Wieditz, Universal Oil Products Co., was the second paper on the program. In an extension of previous work on the effect of various compounding ingredients on the antiozonant requirements of typical compounds, Wieditz reported that the antiozonant requirements of the recently developed oil furnace-black replacements for channel blacks are of about the same magnitude as the finer particle sized standard furnace blacks, such as HAF, ISAF, and SAF types. Work with antioxidant-antiozonant combinations has shown that although most antioxidants do not possess antiozonant properties, it is possible to supplement the ozone protection provided by Universal Oil antiozonants by selectively choosing the antioxidant for use with the antiozonant.

No serious loss of ozone resistance was found when one-half of the SBR was replaced with reclaimed rubber in an antiozonant containing SBR side-wall type compound.

With stereospecific rubbers, synthetic polyisoprene is a little more difficult to protect than is natural rubber. Polybutadiene requires somewhat less antiozonant than natural rubber for an equal degree of ozone protection and appears to have antiozonant requirements intermediate with respect to SBR and natural rubber, the speaker said.

"Recent Developments in Natural Rubber," by Ralph F. Wolf, Natural Rubber Bureau, was the final paper on the program. He emphasized at the outset that the production of natural rubber is increasing every year and that the *Hevea* tree is still the most economical rubber producing factory in the world. Renewed interest is being shown in Technically Classified natural rubber after a lapse of interest of several years in such rubber.

Other developments reported were the commercial availability of a partially purified pale crepe with less than half the ash and protein content of normal rubber, natural rubber with enhanced low-temperature resistance made by isomerizing 6% of the rubber from the *cis* to the *trans* form in the user's factory, and the value of graft polymers of NR and methyl methacrylate for adhesives for the bonding of rubber to leather, textiles, poly(vinyl chloride) and other plastics, and metals.

The Superior Processing rubbers and PA-80, the concentrated form of these cross-linked modifications, have proved to be important aids in processing both NR and SBR compounds. Work is being renewed on NR-carbon black masterbatches, and the oil extension of NR is also being given consideration, it was further said.

At the dinner-meeting Chairman Peters asked the members to stand for a moment of silence in tribute to a distinguished member of the Group, Harry L. Fisher, whose death had occurred on March 19 in Claremont, Calif.

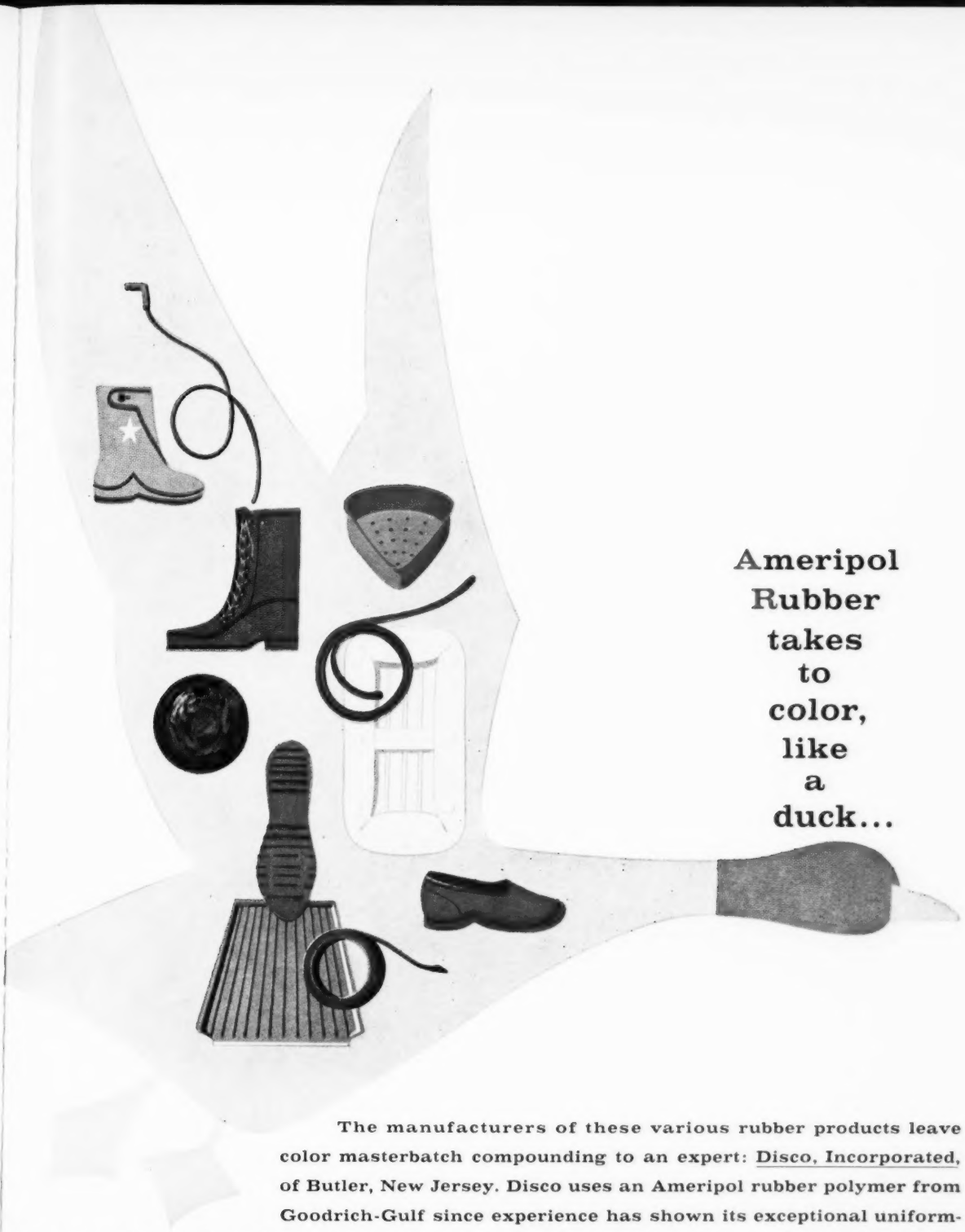
Advanced Rubber Course

The Connecticut Rubber Group will sponsor an Advanced Rubber Technology course at Sterling Laboratory, Yale University, starting September 21, for approximately 10 sessions, Thursdays at 7:30 p.m. The curriculum includes new mixing techniques and equipment; new testing techniques and equipment; radiation, vulcanization, and compounding for radiation resistance; statistics; stereo specific polymers; new developments in neoprene and "Hypalon"; high-temperature polymers; textiles and fabrics; latex applications; adhesives; plastics; and plastic rubber blends.

Plans are being completed by the following Education Committee: A. Murdoch, Armstrong Rubber Co.; G. Sprague, B. F. Goodrich Co.; C. Larson, Wyrough & Loser; H. Gordon, Bond Rubber Corp.; V. Chadwick (chairman), Armstrong Rubber Co.; R. Ward, E. I. du Pont de Nemours & Co., Inc.; F. Villa, Whitney Blake Co.; and R. Fitzgerald, Tyrex, Inc.

For further information write V. Chadwick, Armstrong Rubber Co., 475 Elm St., West Haven, Conn.

Connecticut Rubber Group Education Committee: Murdoch, Fitzgerald *(standing)*, Sprague, Larson, Gordon, Chadwick, Ward, and Villa



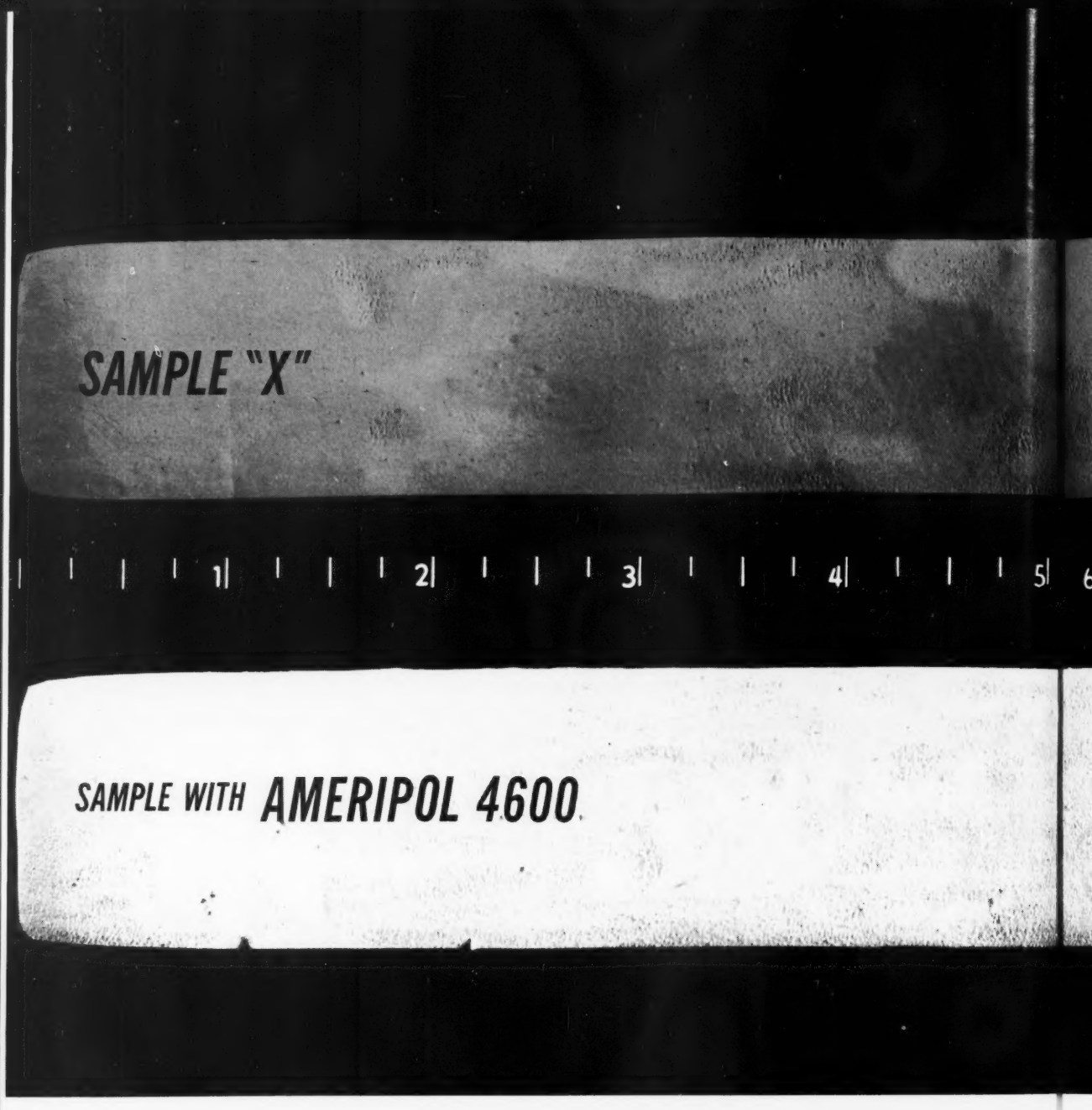
Ameripol Rubber takes to color, like a duck...

The manufacturers of these various rubber products leave color masterbatch compounding to an expert: Disco, Incorporated, of Butler, New Jersey. Disco uses an Ameripol rubber polymer from Goodrich-Gulf since experience has shown its exceptional uniformity, and excellent dispersion characteristics. This simplifies color compounding—and with pigments costing up to 30 dollars a pound, variations can't be tolerated. In addition, Goodrich-Gulf service... in convenient warehousing, dependable delivery, and technical assistance, contributes to an efficient operation. For complete service, come to the world's largest source of synthetic rubber. Goodrich-Gulf Chemicals, Inc., 1717 East 9th Street, Cleveland 14, Ohio.

Ameripol
THE PREFERRED RUBBER

Goodrich-Gulf Chemicals, Inc.

THE ONE TO WATCH FOR NEW DEVELOPMENTS



Ameripol 4600* "Yields" more in sponge recipe

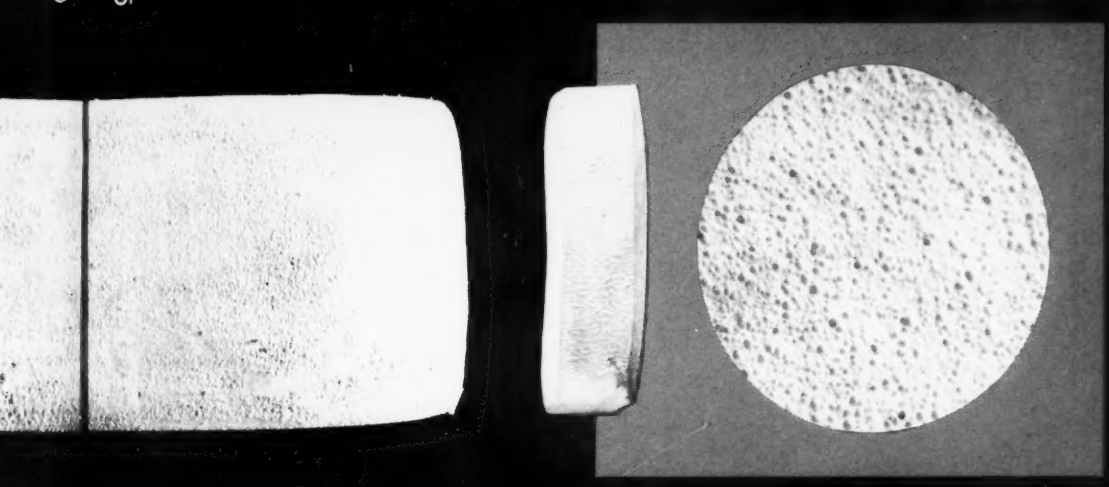
The test strips above show how the Goodrich-Gulf Technical Service Laboratory was able to help a producer of closed-cell sponge shoe soles improve his product.

The customer sent for evaluation a sample of the stock he was using. This stock was not giving the desired cell structure. Weight and density of the finished article were too high. This material is Sample "X"... a blend of a 1703 type of SBR and natural rubber.

A recommended highly loaded recipe using Ameripol 4600 proved superior, as shown by the samples above. Note the more uniform, open cell structure with Ameripol 4600. And the 4600 sample is larger in dimensions. With reduced density, the "Yield" or volume of sponge stock per pound of raw materials was increased.

These qualitative improvements were realized at a considerable savings. Use of the recipe with 4600

Ameripol
THE PREFERRED RUBBER



COMPARISON OF SAMPLES

	Sample "X"	Sample with Ameripol 4600
Cost per pound	$ .2975	$ .1880
Cost on a pound/volume basis	16.36	.0987
Defo Hardness	3500 gm.	2250 gm.
Per cent recovery	99.4%	97.7%

...has better cell structure, too!

cut cost from 16.3 to 9.8¢ on a pound/volume basis.

These results show the advantages of working with Goodrich-Gulf on your rubber needs. Since we produce the broadest range of SBR polymers, we have a wealth of technical data and know-how to share. And our Technical Service Group is ready to help. Put Goodrich-Gulf to work on your team!

*Assigned ASTM number is now Ameripol 1511

RECIPE USING AMERIPOL 4600

Recipe phr	Parts
Ameripol 4600	100
Goodrite 2007	20
RPA #6	0.5
Zinc oxide	5
Aquarex NS	1.75
Titanium dioxide	10
Hard clay	60
Silene EF	20
Agerite Superlite	2
Aktone	2.9
L. P. Circo Oil	10
Unicel ND	8
Petrolatum	3
Altax	1
Sulfur	3
Total	**247.15**

The stocks (0.25 inch slabs) were cured in a Ross flex mold for 8 minutes at 307°F. (confined), followed by 10 minutes at 307°F. (unconfined), then aged 8 hours at 212°F. in a circulating air oven.

Methods for manufacture of closed cell sponge are covered by various U. S. and foreign patents; these should be checked and necessary licenses obtained before use of such processes.

Goodrich-Gulf Chemicals, Inc.

1717 EAST NINTH STREET • CLEVELAND 14, OHIO

Ameripol
THE PREFERRED RUBBER

YOU GET THE WIDEST SELECTION OF SBR POLYMERS FROM GOODRICH-GULF ...WITH TECHNICAL SERVICE TO HELP YOU IN PROPER APPLICATION

Ameripol NON-PIGMENTED RUBBERS

NON-PIGMENTED HOT RUBBERS

1000 Staining. General purpose rubber, easy processing, good aging, for wide range of molded and extruded products.

1001 Slightly staining. General purpose rubber, similar to Ameripol 1000, used where less discoloration is required.

1002 Staining. Similar to Ameripol 1000, exhibits more tack in processing.

1006* Non-staining. General purpose rubber for light colored and white products.

1007 Staining. Good electrical resistance properties. Reduced water absorption.

1009* Non-staining. Has little or no nerve in milling, used as a processing aid in other rubbers.

1011 Non-staining. Tackier in processing than Ameripol 1006, used in adhesives, tapes, molded and extruded goods.

1012* Non-staining. High Mooney 1006. Ideal for cement applications. Excellent flow characteristics and high green strength in compounded stocks. Used to increase tensile and hardness in non-black stocks.

1013* Non-staining. High bound styrene content provides greater thermal plasticity and excellent flow characteristics.

1019 Non-staining. Glue acid coagulated. Low ash content and special finishing result in a polymer that is excellent for wire and cable applications.

*Available in either bale or crumb form.

NON-PIGMENTED COLD RUBBERS

1500 Staining. General purpose cold rubber, better physicals, usually better processing than hot rubbers.

1501 Slightly staining. Similar to 1500, better resistance to staining and discoloring.

1502 Non-staining. General purpose rubber for light colored and white products.

1503 Non-staining. Cold version of Ameripol 1019 for wire and cable applications.

1509 (formerly 4601) Non-staining. Coagulated with Alum making it suitable for low water absorption applications. A medium low viscosity polymer.

1511 (formerly 4600) Non-staining. For light colored and white products. Good physicals on aging. Fast pigment incorporation. Reduced Mooney viscosity.

4604 Non-staining. High bound styrene polymer which is extremely suitable for sponge work, both open and closed cell. Has good processing characteristics.

NON-PIGMENTED OIL-EXTENDED RUBBERS

1703 Non-staining. General purpose 25-part naphthenic oil-extended polymer.

1705 Staining. General purpose 25-part aromatic oil-extended, improved processing and aging.

1707 Non-staining. General purpose where higher oil, 37½-part, can be used. Contains rosin acid for extra tack.

1708 Non-staining. 37½-part oil-extended, highly resistant to discoloration and stain.

1710 Staining. Similar to 1705, higher oil level. Easy processing, excellent physicals at lower cost.

1712 Staining. 37½-part oil-extended, superior processing.

4700 Non-staining. 50-part oil-extended, for greatest economy.

Ameripol MICRO-BLACK MASTERBATCH RUBBERS

MICRO-BLACK MASTERBATCH COLD TYPES

1605 Non-staining. Easy processing extrusion polymer with 50 parts of FEF black also suitable for manufacture of high quality molded goods.

1606 (formerly 4659) Staining. 52 parts of HAF black and 10 parts of HA oil. Used sucessfully for retreading.

1608 (formerly 4664) Staining. A quality tread rubber consisting of 52 parts of ISAF black and 12.5 parts of HA oil.

1609 (formerly 4667) Staining. This SAF Micro-Black can be used to an advantage in applications requiring high abrasion resistance; premium quality products can be made from this polymer. Made of 40 parts SAF black and 5 parts HA oil.

1610 (formerly 4660) Staining. 52 parts ISAF black and 10 parts HA oil. High abrasion resistance suitable for tires camelback.

4651 Staining. 62.5 parts of HAF black and 12 parts of HP oil. Used in camelback tires and mechanical goods.

MICRO-BLACK MASTERBATCH COLD, OIL-EXTENDED TYPES

1805 Non-staining. A low cost general purpose rubber of 75 parts HAF black and 37.5 parts N oil.

1808 Staining. This 75 parts HAF black and 50 parts HA oil polymer is very suitable for camelback and low cost molded and extruded goods.

1809 Staining. 75 parts HAF black and 37.5 HA oil. Applications include tires, camelback and mechanical goods.

4756 Staining. Intermediate loading of black and oil produces quality tread stocks. Contains 75 parts HAF black and 37.5 parts A oil.

4758 Staining. A low cost tread rubber consisting of 82.5 parts of ISAF black and 62.5 parts of HA oil.

4759 Staining. 75 parts ISAF black and 37.5 parts A oil. Applications include high quality camelback and tires.

4761 Staining. 65 parts SAF black and 37.5 parts A oil. Especially suitable where superior abrasion resistance is needed.

For service in the preferred rubber call...

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New York: 200 East 42nd Street • Phone: MUrray Hill 7-4255
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Wilcox, Lumb Address Boston Rubber Group

F. W. Wilcox, Witco Chemical Co., discussed "Factors Influencing Ozone Weather Resistance of Rubber Products," and P. B. Lumb, Polymer Corp., Ltd., spoke on "Aging Behavior of Butyl Vulcanizates" at the spring meeting of the Boston Rubber Group on March 17.

There were 100 persons present at the technical meeting at the Hotel Somerset, Boston, Mass., and 210 at the dinner which followed.

Ozone and Weather Resistance

Wilcox explained that lack of correlation between laboratory ozonator results, roof tests, and service life has made it almost impossible to select proper protective materials for products sold nationally. The ozone test run today is not an accurate method for evaluating the service life of many rubber products, he said, quoting from seven volumes of records covering 10 years of tests. What improved performance in Los Angeles sometimes caused increased failures in the Akron area in the winter, and what appeared superior in the ozonator might fail in roof tests or in service, he declared.

The speaker also noted that use of protective waxes, with and without chemical antiozonants, can be shown to be directly responsible for the type of cracks that develop in rubber products at certain times of the year.

He further stated that two of the three major types of waxes, while giving a good to excellent effect in ozone, fail in cold weather. Type I is of paraffin composition with a melting point of 145-165° F. Type II is micropara with melting point of 145-155° F and straight para with melting point of 138-143° F. On the other hand, Type III, a micropara blend with melting point of 150-160° F., shows only fair effect in ozone, but excellent year-round service.

Some of the best results secured under repeated tests failed statically; therefore it is important in dynamic tests and under such service conditions to check ozone resistance, roof tests, and repeated flexing tests, he said.

Butyl Aging

Dr. Lumb presented a paper originally given by D. C. Edwards before the German rubber industry meeting in West Berlin in October, 1960.

Both crosslink and chain scission occur in sulfur cures of butyl polymers, but chain scission predominates in quinoid and resin cures, tests run on aged samples indicated, the speaker stated.

The amount of crosslinks per cubic centimeter of insoluble network was determined by using swelling methods to measure network density of aged samples cured by sulfur, quinoid, and resin methods. Both gum and FEF carbon black stocks of polymers of 0.8, 1.4, 2.2, and 2.8 mol % unsaturation were examined.

Aging tests run in air at 177° C. for quinoid cures and at 149° C. for sulfur cures showed decreasing degradation with increasing polymer unsaturation. With resin-cured vulcanizates aged at 177° C., no relation with unsaturation was noted. Stress-retention data supported swelling tests.

Di-Cup cures of 50% HAF phr., heated at 144° C. and subjected to strain, showed, from the five-minute stress retention test, response to attack varying from predominant scission at low levels of unsaturation to predominant crosslinking at higher levels of unsaturation. The fact that resin cures failed to show this effect was attributed to the antioxidant effect of the resin itself. Degradation of the resin-cured stocks was attributed to direct attack of oxygen on the polyisobutylene chains and not to thermal degradation at the temperatures encountered.

Quinoid and resin-cured stocks examined for degradation at 177° C. in water showed no damage in 120 hours when air was absent, an indication that there was no hydrolytic scission. Air caused a continuous, gradual degradation with both types of cure. With both air and water present, there was rapid surface attack, but underlying portions were only slightly affected.

Tests were also repeated with a variety of compounds using "Hypalon," neoprene, Hycar, stannous chloride and several resins.

Business Meeting

During the banquet two items of business were conducted. The first was the traditional one of honoring the outgoing chairman. Retiring Chairman James J. Breen, Barrett & Breen Co., was presented with a tie-clip inscribed with a gavel and his name by Chairman George Herbert, Tyer Rubber Co., on behalf of the Group.

The second item of business was the adoption of an amendment to the By-laws concerning membership. In the future memberships or renewals will only be accepted between the first of the year and the October meeting. Anyone not joining the Group or paying delinquent dues by the conclusion of the October meeting will be unable to do so until December 31. This action was deemed necessary to prevent memberships being taken for the sole purpose of attending the Christmas party. The burden of servicing these memberships plus the lack of facilities to accommodate a larger party made some type of restriction essential.

Reprints Available

Reprints of the article, "Available Synthetic Rubber Latices," which appeared in the March issue of RUBBER WORLD may be obtained at a cost of 20¢ a copy.

This is a complete list of synthetic rubber latices offered in the United States and Canada including acrylic, SBR, CR, fluorocarbon, IIR, and NBR types for use in the rubber, textile, paint, paper, and adhesive industries.

Write: RUBBER WORLD, 630 Third Ave., New York 17, N. Y.

Zinc in Vulcanization

Merton L. Studebaker, of Phillips Petroleum Co., spoke on "The Role of Zinc in Vulcanization: Some Facts and Some Speculation," at the February 21 meeting of the Elastomer & Plastics Group, Northeastern Section, ACS. Sixty members and guests were present at the meeting at Science Park, Cambridge, Mass.

Studebaker divided accelerators into two groups in discussing the effects of zinc in each. The first group, which provides strongly thiophilic anions during vulcanization, includes the thiazoles, dithiocarbamates, thiurams, and sulfenamides, he said. This group's reaction with zinc results in attack on the S_x of the R—S—S_x—S—R (polysulfide) crosslinks, and increased dehydrogenation at α-methylene carbon atoms, resulting in cross links of diallyl monosulfidic or allyl-alkyl monosulfide types.

The second group includes amines, aldehyde-amine and guanidine compounds. The sulfide ion of this group (—SH) is effective in opening S_8 rings and promoting the action between sulfur and rubber, but is not believed sufficiently thiophilic to provide strong attack on di-tertiary polysulfides. The latter are believed to be the principal form of crosslinks in natural rubber vulcanizates accelerated with DPG or aldehyde-amine accelerators, he explained.

Studebaker also said that soluble zinc sulfide, which is believed formed by reaction between sulfur and nitrogenous bases in the presence of soluble zinc during vulcanization, appears to react like hydrogen sulfide with unsaturated hydrocarbons and with the quinoid structure of carbon black.

The formation of polysulfide crosslinks, he added, is postulated through addition of hydrogen sulfide elements to double bonds of natural rubber by means of this soluble zinc sulfide, forming mercaptan (tertiary) groups which

(*Continued on page 100*)

washington report

By JOHN F. KING

House Group Votes 2¢ Tax Increase On Tires, Tubes, Tread Rubber

The rubber industry won at least a partial victory April 24, when the House Ways and Means Committee approved a compromise plan to increase excise taxes on tires, tubes, and tread rubber 2¢.

The House Committee went along with an Administration request for an increase on tires and tubes from the present 8¢ a pound to 10¢. It voted, however, to raise the present 3¢ tax on tread rubber to only 5¢, rather than the 10¢ requested by the Administration. Retreaders had warned that an increase of more than 200% in the tax would make it very difficult for them to compete with sales of low-priced new tires.

Trucks and Buses Also Hit

The Committee also voted a tax of $3 per 1,000 pounds of weight on trucks and buses over 26,000 pounds, double the present $1.50 tax (the Administration had asked for $5 per 1,000 pounds) and voted to retain the 4¢-a-gallon tax on gasoline and diesel fuel, 1¢ of which was due to expire June 30.

It also voted to divert more than $143 million from the existing manufacturers' tax on trucks, buses, and trailers from the general fund to the highway fund, in line with recommendations by The Rubber Manufacturers Association, Inc., and trucking interests.

It is estimated that the fuel tax will bring in $600 million, the weight tax $100 million extra, the tire and tube increase $66 million, and the higher tread rubber tax $24 million.

The Committee's proposed plan will become part of the Public Works Bill, which must go to the full House and then to the Senate for final action.

The Rubber Manufacturers Association, the National Tire Dealers & Retreaders Association, and other groups opposing tax increases must now decide whether to settle for the compromise plan or seek further modification by the House.

RMA Disappointed

When asked to comment on the Committee's plan, Ross R. Ormsby, RMA president, said that his organization was studying the situation and had not decided on what action, if any, would now be taken. He did say, however, that the RMA still stood by its recommendations made in testimony before the Committee, March 21 (see RUBBER WORLD, April, 1961, page 90), which it feels are sound and equitable, and that it is very disappointed in the present proposal.

Mr. Ormsby argued that 63% of the proposed 25% tax increase on tires, approved by the Committee, and 61% of the proposed 233% increase on tread rubber, cut by the Committee to 67%, would be borne by the owners of passenger cars, and 16% would come from the owners of small trucks. He noted that these groups had borne most of the burden when tire taxes were raised 60% and when the 3¢ tax on tread rubber was imposed in 1956 when the Federal Government's $41 billion highway program was launched.

W. W. Marsh, executive secretary of the National Tire Dealers & Retreaders Association, explained at that time that since the retreaded tire uses nine pounds of tread rubber, an increase in the tax from 3¢ to 10¢ per pound would increase the tax per tire from 27¢ to 90¢; whereas the new tire tax would amount to about 38¢ for a tire weighing about 19 pounds. (Under the tax voted by the Committee this would be an increase in tread rubber tax from 27¢ to 45¢, still higher than the new tire tax.) This would only widen the competitive gap with new tires, he said.

The tax bill is designed to collect $58 billion over the next 11 years to pay the cost of the highway program.

The RMA had proposed that with about $36.7 billion now earmarked for highway programs, Congress had only to earmark $4.9 billion of the $21.2 billion balance in user taxes for the General Fund for construction needs. This, Ormsby said, would put the total highway program back on schedule, and leave over $16 billion in user taxes in the General Fund to finance other, non-highway federal projects.

Pension Fund Taxable

The U. S. Tax Court, in an unusual case involving a rubber company and its employe retirement fund, has ruled that when an employe trust fund leases machinery to a company it is engaging in a trade or business. The retirement fund, therefore, must be taxed on its "business income."

The April 17 ruling arose from the fact that the Cooper Tire & Rubber Co. Employes' Retirement Fund, a tax-exempt employes' trust created by Cooper Tire & Rubber Co., purchased 20 tire manufacturing machines and a press which it then leased to the company at yearly rentals for a period of 10 years.

The Retirement Fund financed the $344,830 worth of equipment in part by borrowing $200,000 from a bank. The lease arrangement with the company provided an option to extend the 10-year lease for additional five-year periods. During the first 10-year period, Cooper was to pay its employes' trust yearly rentals which ranged between $69,600 in the first year to $22,200 in the tenth year.

The Internal Revenue Service held that the otherwise tax-exempt Retirement Fund was engaging in an "unrelated trade or business" within the meaning of the revenue code; consequently the rental payments received by the Fund from the company were taxable as unrelated business taxable income. The Fund's trustees, W. Robert Brewere, R. Henry Davis, and B. E. Esterly, appealed the IRS ruling to the Tax Court. The court upheld IRS.

RMA Opposed to Senate Patent Bill

Legislation pending in the Senate to give the government full legal title to all inventions and subsequent patents made by any contractor arising from business he does with federal agencies came in for criticism of the strongest sort in April.

The rubber industry, joining with other segments of American industry, charged that the legislation was confiscatory and would impede, rather than promote, improved research and development programs by industry.

The occasion for the criticism was the April 21 deadline set by the Senate Judiciary Committee's Subcommittee on Patents, Trademarks and Copyrights for comments from interested business groups on two bills sponsored by Sen. John L. McClellan (Dem., Ark.), the subcommittee chairman, and Sen. Russell B. Long (Dem., La.).

The two bills they sponsor would either (1) give the government full legal title and exclusive rights to any invention made by contractors in the performance of any obligation arising from a contract or with a grant from the government, or would (2) set up a new government agency to take out United States and foreign patents on such inventions and grant royalty-free licenses for governmental purposes and royalty-bearing licenses for commercial purposes.

Government patent policy currently secures royalty-free licenses to use the inventions for governmental purposes, while inventing contractor has non-governmental or commercial rights to such inventions.

Not in Public Interest

The Rubber Manufacturers Association, Inc., in a brief to the subcommittee, April 21, did not make any claims as to the effects on rubber manufacturers by a substitution of the current liberal patent policy with the McClellan-Long title policy, contending only that the proposals are "not in the overall public interest." Other industrial groups, however, explained in detail why they disapproved the legislation. The Electronics Industries Association, for instance, asserted the legislation would do "incalculable harm" to the electronics industry's 750,000 employes and 110,000 scientists and engineers.

RMA Proposals

Despite RMA's lack of dramatic assertions about the impact of the legislation on the industry, it left no doubt in the subcommittee's mind that it vigorously opposes the whole idea. Speaking for its 175 member companies, the Association gave six reasons why:

(1) To achieve its policy objectives, the government does not need "anything more than a royalty-free license to use inventions made under government contracts."

(2) The pending legislation "would strike a major blow at the patent system because it would put increasing numbers of patents in the hands of government where they would not provide incentive to anyone. The constitutional basis of our patent system is to encourage invention. Confiscation of inventions by government destroys incentive."

(3) The McClellan-Long bills seek "to solve a non-existent problem." Most companies, RMA explained, see no need of a change in patent policy that permits the government to take patent rights away from the originating contractor and "distributing them to the rest of the business community" as largesse.

(4) The omnibus approach to government patent policy—which would handle government research in the same way regardless of the agency involved—might even include inventions made incident to a supply contract where the government was merely purchasing goods and had no intention of contracting for inventions.

(5) The proposal to establish a new government agency to license to others for commercial use inventions made by contractors under government contract would be "incongruous." "If the royalty asked were nominal, would-be commercial users would not have much incentive to go through the procedure prescribed for getting the license because they would know that all other companies could get a license just as easily, and none would have any competitive advantage."

(6) Thus the legislation "would tend to discourage companies with long research experience in specific fields from seeking government research and development contracts, since resulting inventions would be made available to their competitors for commercial use." This attitude would deny the government, RMA said, the benefits of the most advanced research experience available, especially in the defense effort.

RMA concluded: "We believe that this type of legislation would not be in the best interests of the government because it would jeopardize acceptance of and performance under research and development contracts. We submit that any legislation in this field should follow the present practice of the Department of Defense, giving the government a royalty-free license for governmental purposes and allowing the contractor to retain full rights for non-governmental purposes."

FDA Warns—Extension No Automatic Exemption

Congress has approved a three-year extension of the March 6, 1961, deadline date for compliance with the controversial food additives amendment, and President Kennedy has signed it into law. But the Food & Drug Administration has cautioned manufacturers that extension of the law does not automatically exempt them from compliance with the law forthwith.

On April 11, FDA Chief George Larrick said previously granted or pending exemptions, such as the Rubber Manufacturers Association's catalog of compounds for which it seeks an FDA clean bill of health, are good only until July 1, 1961. This short-term extension, Larrick said, is being made so that manufacturers submit necessary data for FDA evaluation.

He said no extension from the sanctions of the additives amendment can be granted unless the substance involved can be shown to present no undue risk to the public health during the extension period. Requests for extension beyond July 1, he added, will not be granted, moreover, unless this information is provided:

(1) Detailed specification or chemical designation of the substances submitted for FDA's okay, the uses for which they are desired, and the amount and purposes involved in their usage.

(2) A statement outlining actions taken to determine applicability of the Food Additives Law, plus the estimated amount of research work needed to date.

Any extension beyond January 1, 1962, Larrick added, will be conditional on approval of a progress report every six months. These same criteria, he said, will apply on obtaining further time extensions from the 1959 law dealing with chemicals used in agriculture.

RMA's petition for blanket clearance of thousands of items, which technically are classified under the law as food additives, was submitted January 4 after an RMA research committee compiled reams of data to show the listed items were safe for use in the food and beverage industry. The petition was revised at FDA's suggestion and was resubmitted April 3.

Loopholes Closed On Footwear Tariff

The Treasury Department's new Commissioner of Customs, Philip Nichols, Jr., has closed up a couple of those ever-recurring loopholes in the imported rubber footwear tariff. On April 11 he ruled that imports of two types of footwear—those having soles

which, while not made of rubber, have the characteristics of rubber, and those having uppers which, while not the same types of cloth specified in the tariff, are "substantially similar" to the specified types—are subject to the American Selling Price Principle.

This ruling means these imports will be assessed the statutory rate, which in most cases is a stiff one, which is based on the U. S. selling price, not the foreign market value of the footwear.

This tariff formula will be applied to all imports with soles having the characteristics and appearance of rubber, but which are some other substance. Footwear with soles of non-rubber materials have been coming in which appear to be tennis shoes, basketball shoes, "Ked-type" shoes, and sneakers.

Other types are coming in from other countries with uppers of various materials, including rayon and toyo cloth, which are substantially similar to those types whose uppers have been ruled to take the American selling price. From now on, under Nichols' order, customs appraisers will take into account their general appearance, durability, commercial interchangeability, and adaptability to substitution in determining their similarity to footwear dutied at the U. S. value.

URW Signs with Firestone, Goodyear

The United Rubber Workers has negotiated new two-year company-wide contract agreements with Goodyear Tire & Rubber Co. and Firestone Tire & Rubber Co. The agreement with the latter provides for a surprise wage boost of up to 14½¢ an hour.

Firestone Contract Sets Precedents

A precedent set in the new Firestone contract is the differentiation in the wage hike between tire and non-tire rubber production workers, something rubber company management has urged for years. The pact provides that tire production workers will get a 14½¢ increase over the two-year life of the contract; while non-tire workers will get only 7½¢ an hour. A second precedent was the fact that wages figured in the contract talks. Normally, URW negotiates a general contract with reopener provisions to settle the matter of wage boosts.

The new Goodyear contract, settled in Dayton half an hour before the midnight, April 15, deadline, covers 20,000 workers in 11 Goodyear plants. Besides extending the basic contract under which URW will work, the Goodyear pact provides for increases in supplemental unemployment compensation (SUB).

Under the Firestone agreement, covering 17,000 employes in eight cities, provision is made for a 7½¢-an-hour wage increase in all tire plants, effective June 5. On the same date a 3½¢ hourly increase becomes effective in all non-tire plants. On June 11, 1962, an additional 7¢ an hour is provided for workers in the company's tire plants; while workers in non-tire plants will receive a 4¢-an-hour increase.

Fringe Benefits Increased

As does the Goodyear contract, the Firestone pact provides for improvements in SUB, improved vacation rights, holiday pay, and several protective provisions covering workers displaced by automation.

Whether the wage settlement with Firestone will be included in other company contracts currently negotiating with URW—and whether the union will reopen the just-concluded Goodyear pact to discuss wages—was not clear. URW has negotiations under way with the other three members of the Big Five—Goodrich, U. S. Rubber, and General.

URW settlements with Goodyear and Firestone, when wage reopener talks were held last summer, produced a 9½-cent-an-hour increase which became the pattern for the industry later in the summer. The questions of whether the new wage boosts will bring price increases also was not answered.

Union spokesmen, explaining the precedent-setting differentiation between the wage increases negotiated for tire and non-tire workers indicated that Firestone impressed on them the need of going slower with non-tire wage rates because of increasing foreign competition. Although the union has not mentioned foreign competition as a main factor in assuring job security—URW has concentrated instead on automation as the main threat to jobs—apparently it accepted the Firestone argument.

This man making a practice entry into the Project Mercury capsule is wearing a space suit made by B. F. Goodrich Aviation Products, Akron, O., which, in an emergency, can surround him with an artificial environment similar to the atmosphere of the earth.

Zinc in Vulcanization

(Continued from page 97)

are oxidized by sulfur in the compound to the di- or polysulfide forms.

Thus "soluble zinc" prevents loss of hydrogen sulfide from the vulcanizate, making it available in soluble and reactive form for reaction with the rubber, and prevents the inhibiting action of free hydrogen sulfide, the speaker explained. When excess soluble zinc sulfide forms, it precipitates, removing hydrogen sulfide from the vulcanizing stock and effectively buffering the hydrogen sulfide, he said.

Rubber Chemicals Down

United States production of rubber chemicals dropped from 210 million pounds in 1959 to 200 million pounds in 1960, the U. S. Tariff Commission reported, for a decline of 5%.

Sales dropped from 159 million pounds, valued at $102 million, in 1959, to 153 million pounds, valued at $101 million, in 1960.

The Commission explained that the smaller output of rubber processing chemicals last year is attributable to decreased production of cyclic and acyclic accelerators.

Instrument Conference To Be Held in Toronto

The Instrument Society of America, Pittsburgh, Pa., will sponsor the International Instrument-Automation Conference and Exhibit in Toronto, Ont., Canada, from June 6-8. Forums on measurement, data processing, and automatic control will be held at the Royal York Hotel, and the exhibit will be located at Queen Elizabeth Building, Exhibition Park.

Technical and management personnel will be able to examine the equipment of more than 150 instrument manufacturers including transducers, computers, recorders, controllers, test, telemetry and analysis equipment. Conference topics will include impact of automation on management decisions, training needs imposed by systems engineering, control of waste water disposal systems, and nuclear and conventional power plant instrumentations.

Firestone and General Sue Each Other over OE-SBR Patent

Firestone Tire & Rubber Co., along with McCreary Tire & Rubber Co., has gone to court to overturn the patent covering high-Mooney oil-extended SBR process which The General Tire & Rubber Co. won on December 13, 1960. (See RUBBER WORLD, January, 1961, page 79.) Four days later, General filed an infringement suit in U. S. District Court against the Firestone Company.

Charging that General's claims under the oil-extended rubber patent "merely define an obvious use for an old material," Firestone and McCreary petitioned the Federal District Court in Baltimore in April for a decree granting them a worldwide royalty-free license to make, use, and sell tires and tread stock made from the process which General has patented. They also asked for a declaratory judgment forbidding General from "harassing" them with threats of litigation for patent infringement. Firestone is now producing oil-extended synthetic rubber which it sells to McCreary Tire & Rubber Co.

Goodyear and U.S. Sued Previously

General already has brought suit against Goodyear Tire & Rubber Co. and United States Rubber Co. for infringement of the patent; so the issue of the validity of General's patent and its right to enforce it by collecting royalties from other firms using the oil-extended process will be tested again in other court actions. These suits were brought by General in Federal District Court in Cleveland the day General was awarded the patent (No. 2,964,083). General reportedly wants a royalty of ¾¢ per pound under licenses it would grant to other firms using the process which today is used in most of the tread rubber produced in this country.

In their suit brought in the Baltimore court, Firestone and McCreary seem to raise most of the objections to General's patent that the government raised in opposing the grant in the long litigation that preceded the company's struggle for exclusive rights to the process discovered by three General scientists a decade ago.

These claims were knocked down by Federal District Judge Alexander Holtzoff last June (see RW, July, 1960, page 101) who ruled that the General process —in which large amounts of oil are added to tough synthetic rubber to produce a superior type rubber—"achieved a novel product of a patentable character."

In that ruling, Holtzoff conceded that "prior art clearly indicates the use of oil in the processing of rubber for various purposes"—the main contention of the government in opposing the General patent. "However," he said, "oil was generally used in small quantities rather than the large quantities as is done by the (General) inventors . . . (and) this discovery was not obvious in the light of prior art."

RFC Contract Cited

The Firestone-McCreary complaint, filed by Attorney Benjamin C. Howard on behalf of the companies, made several points. It said a research contract Firestone had entered into January 1, 1949, with the old Reconstruction Finance Corp., under the Rubber Research Act of 1948, gives it the right to a worldwide royalty-free license to produce oil-extended synthetic and that McCreary, Firestone's customer, has a "derivative" right to use oil-extended rubber without having to pay royalty fees to General under the December 13 patent.

The complaint added that General has charged them with infringement and "has harassed by threats of litigation based on said patent tire manufacturers," including the plaintiffs, and "has sought to persuade (Firestone) to accept a royalty-bearing license." These actions by General, the two petitioners said, has caused them "material and substantial damage." It therefore asked the court to decree they have royalty-free licenses and that the General patent is invalid.

By way of technical information to support their claims, Firestone and McCreary made these points:

(1) At the time the alleged invention was made, "differences between the subject matter sought to be patented and the prior art were such that the subject matter as a whole would have been obvious to persons having ordinary skill in the art to which the subject matter pertains.

(2) The specification of the patent does not contain a written description of the process in the "full, clear, concise and exact terms" required by law, so that the claims of the patent "are vague and indefinite."

(3) The process had been invented by, was known to, and was used by others before General applied for the patent, and it had been described in printed publications prior to General's application.

(4) The invention was in public use or on sale in this country for more than one year prior to the General application for a patent.

New Curing Process

New passenger tires marketed by The Firestone Tire & Rubber Co., Akron, O., will have a pattern on the inside as well as on the outside. The interior pattern is the result of a new tire curing process that utilizes an engraved bladder, which allows any air trapped between bladder and tire to escape through the patterned channels, thus eliminating the possibility of ply separation caused by trapped air being driven into the cord body of the tire during the curing process.

ZnO Firm Acquired

Pigment & Chemical Co., Ltd., Montreal, P.Q., Canada, has acquired Canadian Felling Zinc Oxide, Ltd., Milton, Ont. Pigment & Chemical helped in locating the plant at Milton for Felling Zinc Oxide Co., Ltd., Felling-on-Tyne, England, and has acted as sole selling agent since its beginning in 1954. Production and marketing of "Canfelzo" and "Felzodox" brands of powdered, densified, pelleted, and leaded zinc oxides for the rubber, paint, ceramic, textile, and chemical industries will continue as before.

Gates Rubber Co.—50 Years Old

Early factory scene showing Durable Treads coming off production line

"Obstacles—turned into opportunities!" This could be the motto of Gates Rubber Co., Denver, Colo., which celebrates its fiftieth anniversary this year. By regarding trouble as merely a stepping stone to success, the company, manufacturer of V-belts, hose, tires, and mechanical rubber goods, has expanded from a small shop with one product and one employe into a worldwide enterprise.

The Very Beginning

For example, when Charles C. Gates, the founder, came West in the early 1900's to take part in mining activities, he needed a way to supplement his income. So, in 1911, he bought the Colorado Tire & Leather Co., in Denver, a small mail-order firm which manufactured Durable Tread, a steel-studded band of leather which could be fastened over an automobile tire for added mileage. Unfortunately, after sinking $3,500 in the business, Gates found that the big bundle of mail orders for Durable Treads, which the owner had triumphantly showed him as one day's receipts, was in reality an accumulation of several days.

But, determined to make a go of the new business, Gates together with his brother John began to pore over various advertisements and sales letters to see what made them successful. Soon they were writing copy which really sold their product. And even after the company had made a sale, the men frequently asked the purchaser to be an agent for Durable Treads.

The brothers didn't stop there. They decided to make halters from the mountains of scrap leather which were piling up. But how would they attract attention to a product made by a little unknown outfit? Again, obstacles worked for the men. They got the idea of sending a few of the halters to Buffalo Bill, who was in Denver with his Wild West show. In about two weeks the showman sent word that he had used the halters on his wild horses, and "even the wildest cayuses couldn't break them." Naturally, the brothers used Buffalo Bill's testimony for their ad campaign. In fact, the scheme was so successful that the company not only used up all the leather scraps, but had to buy new leather to satisfy the demand.

New Half-Sole Gets Priority

Not even the rubber scarcity during World War I could stop the fast-growing company, which by now had moved into larger quarters. In 1919 the Durable Tread was replaced by a kind of rubber retread set on a fabric carcass which could be cemented over the worn tire. Called the Half-Sole, the retread was given priority since it helped the country save precious rubber.

When the war ended, however, and the price of rubber dropped from $1.25 to 15¢ a pound, the firm cut back on its production and began to manufacture Gates tires. Yet circumstances were still working favorably for the company. When a person brought in a tire which was too far gone to be retreaded, he became a prospective buyer for a new Gates tire.

But the firm still had to hurdle some obstacles. In 1919, an economic slump hit the country, just when the company was beginning to attract attention with its new Super-Tread tire and its V-belt, the first rubber V-belt in history. The larger tire companies began slashing prices and cutting back on their sales activities. But Gates put more salesmen on the job, and spent more money on sales promotion. This courage paid off, for in 1921, while tire sales of other companies decreased 35%, Gates' increased by more than 40%. Also, when the depression of 1933 hit the country, the company again expanded its activities, and thus prospered.

Today, 50 years later, there are eight manufacturing plants, many different products in the four major categories, and nearly 7,000 employes. Plants are located in Galesburg, Ill. (hose); Toluca, Mex. (V-belts and hose), Brantford, Ont., Canada (V-belts, hose, and mechanical goods); Nashville, Tenn. (tires); Sioux City, Iowa (tank linings); Chicago, Ill. (tread rubber); Wichita, Kan. (light-duty pulleys); and the giant home plant at Denver.

Gates Rubber Co. has come a long way!

Firestone Receives Safety Award

The Firestone Tire & Rubber Co., Akron, O., and 16 separate divisions of the company will receive National Safety Council awards for excellent safety records in 1960. Presentations are made on the basis of improvement over the safety performance average of the three previous years.

The Award of Honor, the highest honor given by the Council, will be presented to the Buenos Aires, Argentine, textile plant; the Gastonia, N. C., textile plant; the Los Angeles, Calif., guided missile division; and the Quincy, Ill., Electric Wheel Co. division. An Award of Merit, the second highest award made by NSC, was given to Firestone for all plants on a company-wide basis.

Tire Fabric Facility For U. S. Rubber

United States Rubber Co. will spend $1.5 million this year to install new nylon tire fabric production facilities at its Winnsboro, S. C., plant, according to William E. Clark, vice president and general manager of the company's textile division. Capacity of the new facilities was not revealed.

Clark said the new facilities would include 100-foot-high gas-fired ovens and electronic controls that will enable fabric to be treated in a continuous process. Construction will be completed at the end of the year.

"A growing demand for nylon tire fabric by U. S. Rubber's tire division and many independent tire companies requires the additional production capacity," Clark explained.

Dr. Dinsmore Retires

Ray P. Dinsmore retired May 2 as vice president of The Goodyear Tire & Rubber Co.

His successor as research and development chief has not yet been announced.

The retirement of the internationally known authority on both natural and synthetic rubber precedes by two months his forty-seventh anniversary with the company. A native of Tewksbury, Mass., Dr. Dinsmore was graduated from Massachusetts Institute of Technology in 1914, the year he joined Goodyear. He has been a vice president since 1943 and a member of the Goodyear board of directors since April, 1960.

When he joined Goodyear, the company was primarily a manufacturer of tires and industrial products. In addition to improvements in these products, Dr. Dinsmore was instrumental in the initiation and development of programs leading to Goodyear's entry into the synthetic rubber, plastics, chemical materials, aviation accessories, films, flooring, foams, and shoe product fields.

His leadership in tire research resulted in such innovations as the first rayon-cord tire, the Lifeguard safety tube, the low-pressure Super Cushion tire, and the Captive-Air Steel-Cord Safety Shield tire.

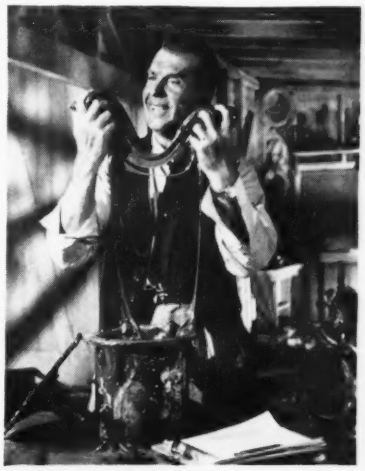
Dr. Dinsmore served as Assistant Rubber Director during World War II, organizing and directing synthetic rubber research and development and coordinating activities of both industrial and university laboratories.

In recognition of his work in synthetic rubber research, he was awarded the Colwyn Gold Medal for 1947 by Great Britain's Institution of the Rubber Industry, and the Charles Goodyear Medal for 1955 by the Rubber Division of the American Chemical Society.

Ray Dinsmore has served as president of the ACS Rubber Division the Akron Section of the ACS, the Akron Rubber Group, and of the American Institute of Chemists; as a director of the American Institute of Chemical Engineers and of the American Section of the Society of the Chemical Industry in Great Britain; as a term member of the MIT Corp., governing body of Massachusetts Institute of Technology; as a trustee of the Midwest Research Institute and of Kent State University; as councilor of Ohio State University Research Foundation; and as a member of the American Academy of Political & Social Service, the Society of Automotive Engineers, and of the board of governors of the Agricultural Research Institute. He is also a Fellow of the Institution of the Rubber Industry in Great Britain, the American Association for the Advancement of Science, and the Royal Society of Arts in Great Britain.

Dr. Dinsmore will continue to advise Goodyear on research and development projects on a consultant basis.

R. P. Dinsmore



© Walt Disney Productions

Professor Brainard (Fred MacMurray) discovers flubber

Flubber—It's Real Cool

Neoprene, nitrile, SBR, stereos, and now flubber. Well, not really, at least only in the fertile mind of Walt Disney, who has come up with a new movie, "The Absent-Minded Professor."

This little farce tells of a college chemistry professor who discovers a substance that generates its own energy by molecular exchange. This flying rubber, or flubber, apparently has no heat build-up at all; each time it hits the ground, it bounces higher and higher.

This "real cool" discovery is great for winning basketball games and solving traffic problems. For example, the professor puts a little flubber on the squad's sneakers, and suddenly the boys soar toward the ceiling. He substitutes the miracle compound for a motor in his Model T Ford, and, voilá, he's flying!

Anyone interested in the recipe?

Thomas F. O'Neil

General Tire Elects T. O'Neil Board Chairman

Thomas F. O'Neil was elected chairman of the board of The General Tire & Rubber Co., Akron, O., succeeding his late father, William F. O'Neil, who founded the company in 1915 and served as its board chairman until his death last September 4.

L. A. McQueen, executive vice president since April 5, 1960, was given the additional titles of honorary chairman and chairman of the executive committee. The board also made Frank W. Knowlton vice president. He had been the company's secretary and general counsel since 1951 and a director since 1953. He will continue to serve as secretary and general counsel.

The following officers were reelected: M. G. O'Neil, president; John O'Neil, chairman of the finance committee; C. J. Jahant, Dan A. Kimball, C. F. O'Neil, J. E. Powers, O. G. Vinnedge, and H. M. Dodge, vice presidents; C. A. Hill, treasurer; E. W. Lutz, assistant treasurer; James Little, assistant treasurer; and J. L. Wade, assistant secretary.

President O'Neil pointed out that all divisions of the company did better business in 1960 over the previous year, with the exception of the tire division where price competition and raw materials costs combined to cut into profits. But Mr. McQueen said he believed the bottom had been reached in the tire decline.

(*Continued on page 113*)

news briefs

GOODYEAR TIRE & RUBBER CO., Akron, O., has added a new tire to its line of Terra-Tires. It is being used on a number of transport vehicles in the sugar cane fields near Clewiston, Fla.

REEVES BROTHERS, INC., New York, N. Y., has appointed Sunbury Textile Mills, Inc., Sunbury, Pa., and Kenyon Piece Dye Works, Inc., Kenyon, R. I., licensed laminators of "Curonized" process.

BECKHAM CO., Akron, O., is now sales agent for Ridgway Color & Chemical Co., division of American-Marietta Co., Ridgway, Pa.

UNITED STATES RUBBER CO. has moved its Buffalo, N. Y., sales office to Gardenville Industrial Park, French and Union Rds., Cheektowaga, a suburb of Buffalo.

B. F. GOODRICH AVIATION PRODUCTS, Akron, O., has been awarded U.S. Air Force contracts totaling $181,432 for aircraft tires for the F-104 Starfighter and for wheels and brakes for the T-38 Talon high-speed jet-pilot trainer.

GARDNER CHEMICALS, INC., New York, N. Y., has been formed as a manufacturers' representative to the paint, printing ink, plastics, and rubber industries.

GRACE CHEMICAL CO. will build a plant near Bogota, Colombia, to produce phthalic anhydride and plasticizers.

PENNSYLVANIA INDUSTRIAL CHEMICAL CORP., Clairton, Pa., has inaugurated technical service and warehouse stocks to serve the northwest area. These services will be rendered through the W. Ron Benson Co., Seattle, Wash., and Portland, Ore. Warehouse facilities will be located at both Security Transfer & Storage Co. and Holman Transfer Co.

CAMPBELL MACHINERY DEVELOPMENT CO. and KENT MACHINE CO., both of Cuyahoga Falls, O., have formed an organization, Campbell-Kent, which will design, develop, and manufacture equipment in the rubber and plastics fields. Campbell will handle designing and developing, and Kent will take care of manufacturing and sales.

THE TYSON CORP., Woodbridge, N. J., has expanded its facilities to include the manufacture and custom compounding of silicone rubber compounds for use in mechanical goods, molding, extrusion, and wire and cable at an estimated capacity of 100,000 pounds per month.

UNITED STATES RUBBER CO., New York, N. Y., has registered "U. S. Royal" with the United States Patent Office as a trade mark for all its industrial, asbestos, and wearing apparel fabrics.

SOUTHERN CLAYS, INC., New York, N. Y., has opened a new research laboratory and separate pilot plant on a 90-acre site near Gordon, Ga., about one mile from the company's main plant.

H. M. ROYAL, INC., Downey, Calif., is now exclusive West Coast distributor of accelerators, vulcanizing agents, and antioxidants for Pennsalt Chemicals Corp., Philadelphia, Pa.

B. F. GOODRICH INDUSTRIAL PRODUCTS CO., Akron, O., has been issued a patent covering the "turnover" conveyor-belt system which allows belts to twist themselves automatically, reversing top and bottom surfaces after delivering and before accepting a new load.

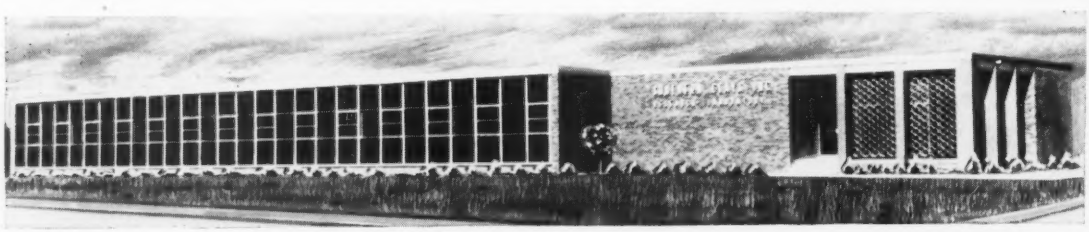
GLOBE RUBBER WORKS, INC., North Quincy, Mass., has been appointed New England distributor by United States Rubber Co., New York, N. Y., for some of its industrial products including hose, conveyor belting, packing, and various molded rubber products.

GOODYEAR TIRE & RUBBER CO., Akron, O., has presented the Dinsmore Merit Award to W. M. Larson, the originator of Neothane translucent tires. The award is given for original thinking and cooperative action in developing new or better products.

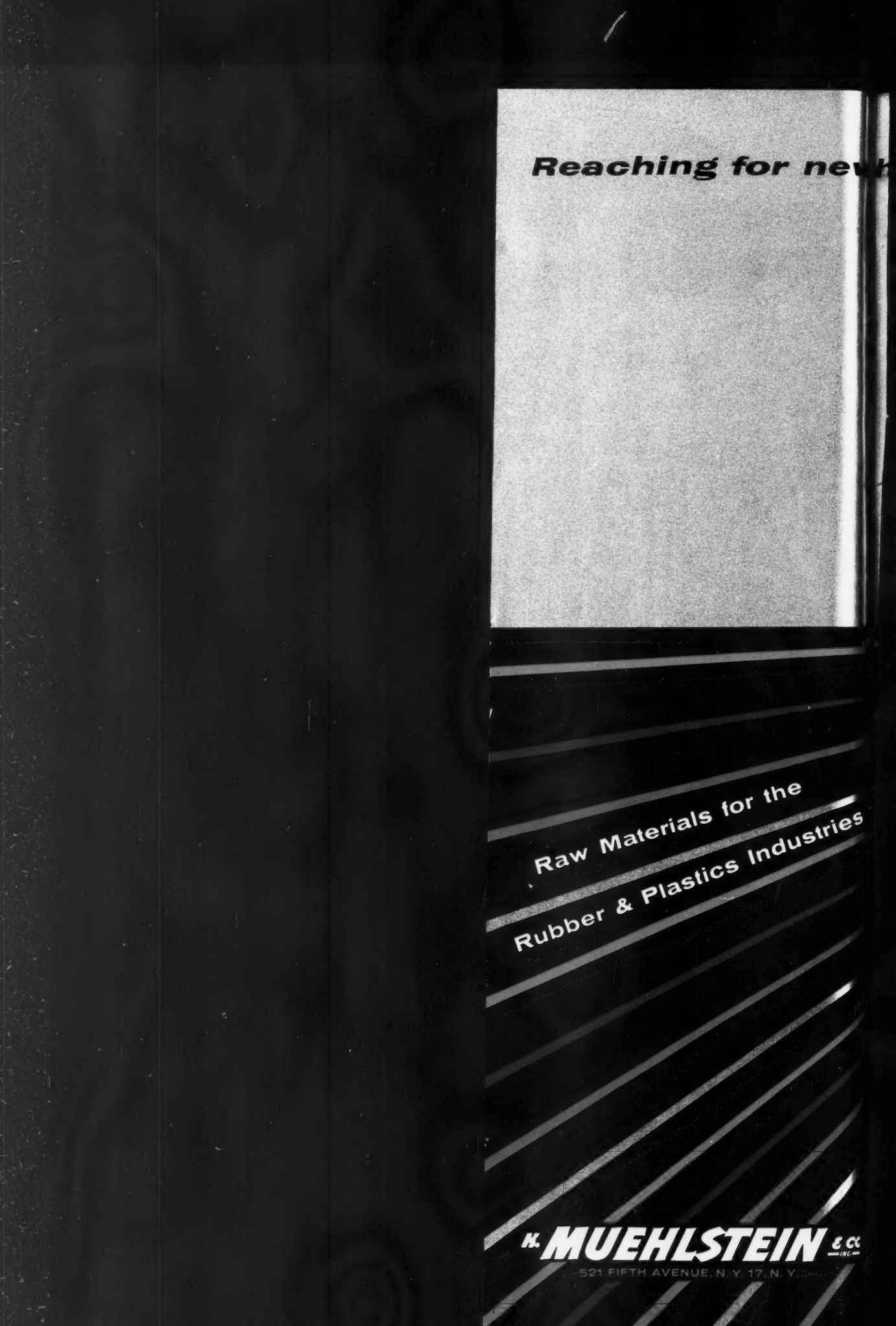
B. F. GOODRICH CANADA, LTD., Kitchener, Ont., Canada, has broken ground for a multi-million dollar, 250,000-square-foot tire plant to be erected in Kitchener's Industrial Park.

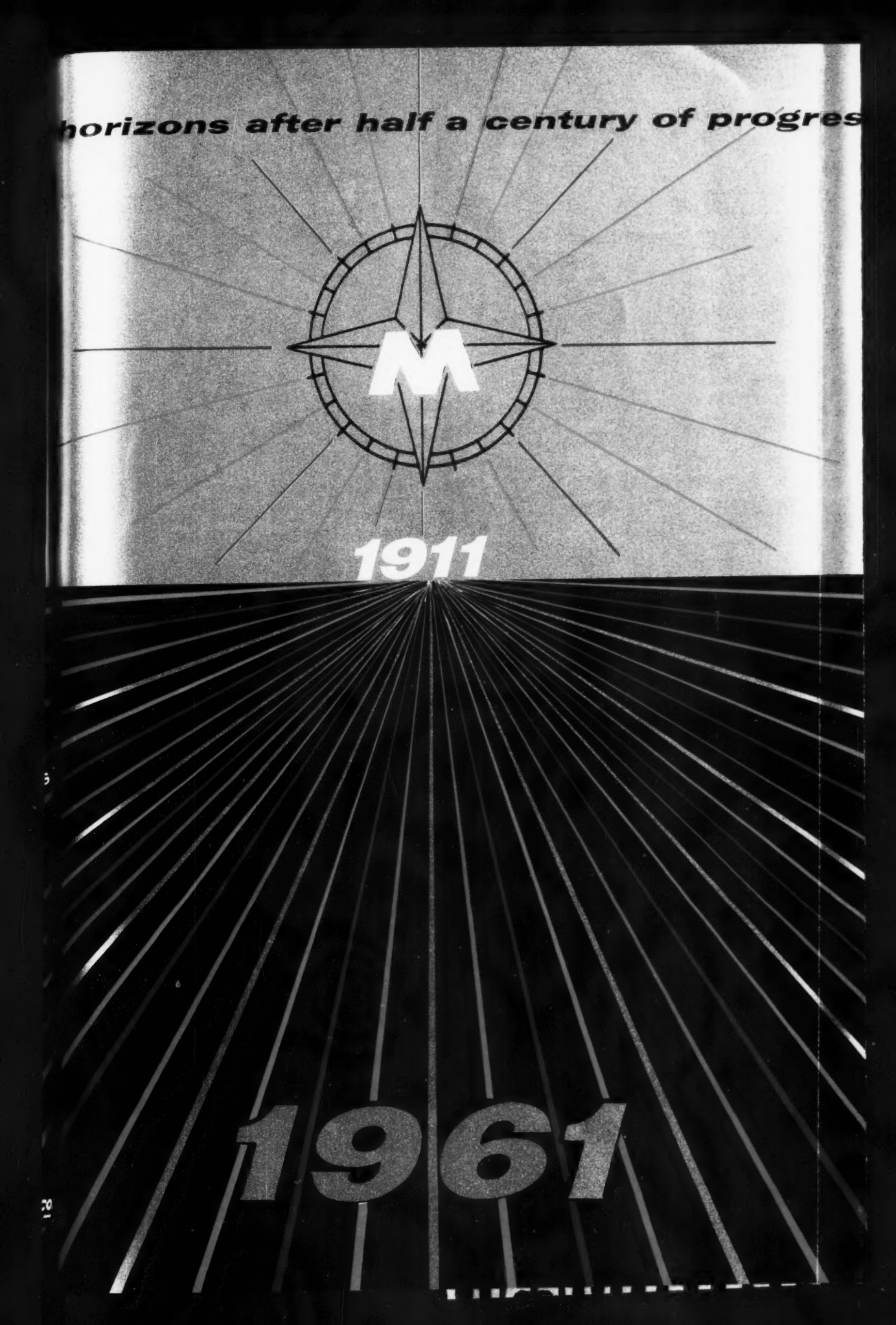
INTERNATIONAL LATEX CORP., chemical division, Dover, Del., has appointed The Horton-Earl Co., Minneapolis sales representative in Minnesota for Tylac Latices.

(Continued on page 113)



Southern Clays new research laboratory near Gordon, Ga.


Reaching for new
Raw Materials for the
Rubber & Plastics Industries
H. MUEHLSTEIN & CO. INC.
521 FIFTH AVENUE, N.Y. 17, N.Y.

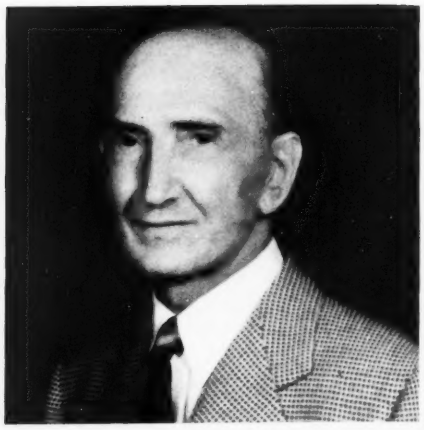

horizons after half a century of progres
1911
1961

S...

we point with pride to the fact that ours is
a business that was built by creative service...
keeping up with the changing times,
looking ahead, introducing the new, but only
if it better served our customer's needs.
Now... as we turn the pages of time, we look
forward to further serving you with the
dedication to duty that has enabled us to grow
through the years to an organization that
girdles the globe.

REGIONAL OFFICES: Akron • Boston • Chicago • Indianapolis
• Los Angeles • Toronto • London • Hamburg
PLANTS & WAREHOUSES: Akron • Boston • Chicago
• Detroit • Indianapolis • Jersey City • Los Angeles
11 OTHER U. S. DISTRIBUTION CENTERS
AGENTS IN 35 COUNTRIES

...a message from our founder



On this important occasion, our 50th Anniversary,
we can look back with great pride
and satisfaction on our substantial progress.
Since our inception, our uppermost hope and desire
has always been to serve the industry with efficiency and
integrity. It is our fervent hope and expectation to render
the same service in the future years.
We are deeply grateful to the industry for the support given us.
We also wish to express our appreciation to
our employess for their zeal and deep sense of loyalty.

H Muehlstein

news about people

C. H. Baldwin

Charles H. Baldwin becomes production manager of United States Rubber Co., footwear and general products division, New York, N. Y. Other appointments include: **Edmund G. Nagle,** general sales manager of manufacturers' products; **Harold N. Barrett,** assistant to **William Pennington,** vice-president and general manager; and **S. Lloyd Sammis,** manager of manufacturing personnel and procedures.

C. M. McKay

Charles M. McKay has become general manager of the United Carbon Co., Inc., synthetic rubber plant in Baytown, Tex.

Clarence B. Bergren, formerly manager of industrial sales for Thor Power Tool Co., Aurora, Ill., has been transferred to Tynemouth, England, as managing director of Thor Tools, Ltd. (formerly Armstrong-Whitworth) British manufacturing subsidiary. **Samuel P. Gartland,** formerly regional industrial sales manager in Indianapolis, goes to Turin, Italy, as managing director of FIAP, the company's newly acquired Italian manufacturing subsidiary.

D. Mueller

Douglas Mueller on May 16 became director of public relations and advertising for Borg-Warner Corp., Chicago, Ill. He succeeds the late **Donn Sutton.**

Philip H. Groggins, Jr., has been named sales manager, resins, for Schenectady Varnish Co., Inc., Schenectady, N. Y. **George Brannick** is now manager, technical service, resins; while **John S. Horn** succeeds Groggins as technical sales representative in the Chicago area.

F. O. Holmes

Frank O. Holmes has been promoted to manager, technical service, for United Carbon Co., Inc., New York, N. Y. **Carl W. Snow** continues as manager, field technical service.

J. W. Keener, president of The B. F. Goodrich Co., Akron, O., has been named a member of the council for the Graduate School of Business of the University of Chicago. He received a master's degree of business administration from the University.

William L. Ferguson has been made a sales representative, Akron district, of Copolymer Rubber & Chemical Corp., Baton Rouge, La.

D. Brittain Briggs, Jr., joins the process design and economic section of Cabot Corp., new products research department, Boston, Mass., as a chemical engineer. **Leslie H. Spiro** becomes European technical service representative in special blacks for the international division; and **James J. Brennan, Jr.,** is a rubber research group leader in the carbon black research department.

C. Edward Bellew has been appointed manager of Garlock, Inc., manufacturing divison, Palmyra, N. Y.

A. W. MacAlonan was elected president of Stalwart Rubber Co., Bedford, O., succeeding the late **H. W. Osborn.** Other appointments include: **Edwin H. Osborn,** executive vice president; **Frank K. Byers, Jr.** and **William P. Lindauer,** vice president and secretary, respectively; **John J. Kravetz,** assistant vice president and director of research and development; **Richard R. Long,** assistant vice president and director-silicone division; and **Albert V. Volpe,** assistant vice president and director-production.

George E. Thompson is now director, SBR process development, for Goodrich-Gulf Chemicals, Inc., Cleveland, O.

Frederick Bissinger has been made president, Tyrex, Inc., New York, N. Y. Other elections include: **Philip B. Stull,** vice president; **Hastings W. Baker,** treasurer; and **Irwin S. Meltzer,** board of directors.

Robert S. Haley is now sales manager of Emery Industries, Inc., Vopcolene division, Cincinnati, O.

Harold J. McCormick has been named manager of advertising and promotion for B. F. Goodrich Tire Co., Akron, O.

Campbell Lewis Gardner becomes sales manager for Schenectady Varnish Canada, Ltd., Toronto, Ont., Canada.

W. L. Ferguson

C. E. Bellew

G. E. Thompson

C. L. Gardner

news about people

D. S. Black

R. L. Eaton, Jr.

Madison Geddes

J. M. Collier

H. de Decker

C. M. Barnes

Donald S. Black and **Roland L. Eaton, Jr.,** are technical representatives, rubber processing and electrical oils, Sun Oil Co., industrial products department, Philadelphia, Pa. Black will service the Ohio Valley and West; while Eaton will serve the East.

H. G. Heedy, assistant director of market development for American Enka Corp., New York, N. Y., has been made product manager for rayon staple fiber. **Paul E. Dochety** and **Jack C. Webb,** technical sales representatives, have been named assistant sales managers for rayon industrial yarns. **Sidney M. Smith,** assistant sales manager for rayon staple, becomes an assistant sales manager for nylon textile yarn; while **J. R. Graham,** who previously served as a sales representative in the Chattanooga, Tenn., district sales office, has been appointed assistant sales manager for rayon staple.

Robert W. Smith, for the past ten years manager of field engineering, Detroit zone, for The B. F. Goodrich Co., Akron, O., will go to The Hague, Netherlands, as European technical representative for International B. F. Goodrich Co.

Joseph N. Kuzmick, divisional manager of Raybestos-Manhattan, Inc., Manhattan Rubber Division, Passaic, N. J., recently was elected a vice president of the company.

Graham W. Corddry and **Claude M. Merrell** have been elected vice presidents of National Lead Co., New York, N. Y. Corddry is manager of the company's Titanium Division; while Merrell directs the firm's foreign operations.

Robert H. Walsh has been named assistant manager, market development, for E. I. du Pont de Nemours & Co., Inc., elastomer chemicals department, Wilmington, Del.

Conrad G. Hurlimann has joined Geigy Industrial Chemicals, division of Geigy Chemical Corp., Ardsley, N. Y., as vice president and director.

John M. Collier has been made sales representative of Goodrich-Gulf Chemicals, Inc., Cleveland, O.

J. M. Gardiner becomes assistant to the president for Thiokol Chemical Corp., Trenton, N. J., representing the company's overall operations, including specialties and chemical operations in the Washington area. **R. E. Davis,** formerly manager, Dayton office, will head the eastern district office at Washington, and **D. R. Thielen,** assistant to the Dayton division manager, is now manager of that office.

Frank Glacken is now manager, marketing research, for the AviSun Corp., Philadelphia, Pa.

Royden L. Schenz, senior sales correspondent for International B. F. Goodrich Co., Akron, O., will go to San Juan, Puerto Rico, as sales supervisor for the division.

B. Herbert Lee is now director of sales—special accounts, for Lee Rubber & Tire Corp., Conshohocken, Pa. **Charles G. Wyman** has been made director of development and research, Lee Division, and **A. H. Nellen,** former vice president—development and research, has retired, but will continue as a member of the corporation's board of directors.

George N. Brunt becomes vice president and general manager of Southern Latex Corp., Austell, Ga., a subsidiary of International Latex Corp.

J. Earl Burrell is now vice president of operations of Pittsburgh Plate Glass Co., chemical division, Pittsburgh, Pa.

C. F. O'Neil, vice president in charge of foreign operations for The General Tire & Rubber Co., Akron, O., has replaced **Joseph A. Andreoli** on the board of directors of International Road Federation, a non-profit service organization established in 1948 to encourage the development and improvement of highways and highway transportation.

H. K. J. de Decker is now export technical manager for Texas-U. S. Chemical Co., New York, N. Y. He will have a Western European address.

C. M. (Pat) Barnes was named president of Dayton Tire & Rubber Co., Dayton, O., a subsidiary of Firestone Tire & Rubber Co., Akron, O.

V. J. Dionne has been appointed sales representative of the newly formed fiber division of Reeves Brothers, Inc., New York, N. Y.

Victor E. Pierson becomes technical sales manager of Anchor Adhesives Corp., Flushing, N. Y.

Frank L. Scales is now secretary-treasurer of Dayton Tire & Rubber Co., Dayton, O. **Robert L. Girton** was made factory manager. Directors include: **J. E. Trainer,** executive vice president of Firestone Tire & Rubber Co., Akron, O.; **Lee R. Shannon,** Firestone comptroller; **John F. Floberg,** Firestone general counsel; **C. M. Barnes,** president of Dayton Tire; and Mr. Scales.

Ben Gordon, 25-year veteran of A. Schulman, Inc., Akron, O., and his son, **Richard S. Gordon,** secretary of the Buffalo Paper Stock Co., Buffalo, N. Y., have been elected to the board of directors of the National Association of Secondary Material Industries, New York, N. Y.

Herbert R. Wickenden has been appointed marketing administrator, commercial development department, of Goodyear Tire & Rubber Co., Akron, O.

F. M. "Doc" Daugherty becomes chief chemist of Burton Rubber Processing, Inc., Burton, O. **Kevin Brown** has been appointed assistant chief chemist; and **J. B. Coffey,** purchasing agent.

Robert E. Colvin has been named Atlanta district manager for B. F. Goodrich Industrial Products Co., Akron, O.

C. O. Thomas has been appointed manager of the Akron training center school of Goodyear Tire & Rubber Co., Akron, O. He succeeds **G. L. Bailey,** now with the company's efficiency division.

Norman G. Gaylord has become an independent polymer consultant and has organized Gaylord Associates, Inc., New Providence, N. J., to carry out contract laboratory research in the organic and polymer fields.

obituaries

J. B. Braden

James B. Braden

James B. Braden, 45, supervisor of United Carbon Service Laboratory, United Carbon Co., Inc., Akron, O., died April 27, in Cleveland Clinic, where he failed to respond to treatment for a blood infection.

A native of Mason City, Iowa, and a chemical engineering graduate of Ohio State University, Mr. Braden has been associated with the rubber industry since 1937. He joined United Carbon two years ago after five years as factory manager for Dryden Rubber Division, Sheller Mfg. Corp., Chicago, Ill.

He is survived by his wife, three sons, and a daughter.

Funeral services were held at the McConnell Funeral Home, Wooster, followed by burial in South Charleston, both in O.

George W. Sawin

George W. Sawin, former president of B. F. Goodrich of Canada, Ltd., Kitchener, Ont., Canada, and of the Rubber Association of Canada, died February 28 at the age of 70.

A 1913 graduate of the University of Delaware, Sawin joined Goodrich that same year and held such positions as Chicago branch manager, 1920 and 1926; New York City district manager, 1924; Akron tire sales manager, 1926; eastern district manager, 1929; Philadelphia district manger, 1931; and vice president and general manager of BFG Canada, Ltd., 1936.

He retired in July, 1951, following a fall in December, 1950, and had made his home in Wilmington, Del., for the past ten years.

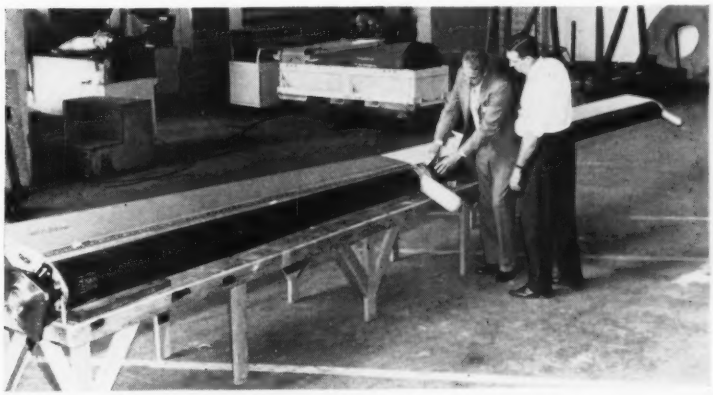
Burial took place March 3 from the Chandler Funeral Home, Wilmington.

Surviving are a son and a daughter.

Dasher Rubber is owner of the special process which makes it possible to mix raw rubber with additives and dry it in one operation. The Patent & Licensing Corp. is licensing agent.

CompuDyne Acquires Two Companies

CompuDyne Corp., Hatboro, Pa., has acquired TransWeigh Co., King of Prussia, Pa., and Automatic Measurement Corp., Phoenixville, Pa., on an exchange of stock basis. The purchase price was more than a half million dollars. Both companies will function in conjunction with Weighing & Controls, Inc., a CompuDyne subsidiary.



A flying TV antenna, extending 23 feet straight down from the bottom center line of a Douglas DC-6AB, will soon be transmitting educational programs to students in a 400-mile-diameter circle surrounding Montpelier, Ind. The antenna will be protected from ice formation by two rubber de-icers made by the B. F. Goodrich Aviation Products, Akron, O.

industry news

(*Continued from page 103*)

Patent Suit Brought Against General Tire

Dasher Rubber & Chemical Co., Fairport Harbor, O., and Patent & Licensing Corp., a subsidiary of the Flintkote Co., New York, N. Y., have brought suit against The General Tire & Rubber Co., Akron, O., charging patent infringement in its use of a special rubber-drying process.

The suit was brought in Federal Court in Pecos, Tex., charging that the process was being used at General's Odessa, Tex., plant. A General Tire spokesman said the company would have no comment on the suit until it had studied it.

news briefs

(*Continued from page 104*)

FOSTER WHEELER CORP., New York, N. Y., has announced that its British subsidiary will construct a $12.5-million plant near Southampton, England, to make butyl rubber for Esso Petroleum Co., Ltd. The facility, with an annual capacity of 25,000 tons of butyl rubber, will be built adjacent to Esso's Frawley refinery.

REEVES BROTHERS, INC., New York, N. Y., has licensed Patex, Inc., Wayne, N. J., to carry out Reeves' patented heat laminating process and to use the trade mark, "Curonized," when the lamination has been made with Curon foam. Another licensee is American Laminators, Inc., Brooklyn, N. Y.

news from abroad

India Expanding Tire Facilities To Meet Needs of Five-Year Plan

India is rapidly expanding its tire facilities, both through expansion of existing plants and construction of new ones, in order to meet requirements of its ambitious third five-year plan, which calls for greatly increased motor transportation that will double or even triple present tire requirements.

Planners who envision tremendous industrial expansion over the next half-decade fear that even plans to more than double tire production will leave India with a critical tire shortage. More cautious circles, however, doubt that industrial expansion will be great enough to use the planned production, leaving the country with an oversupply.

Firestone and Dunlop, two of India's old-established companies, have increased capacities of their plants in Bombay and Calcutta to give a combined capacity of about 1.5 million tires a year. In addition, five new factories have been licensed with a total annual capacity of 1,067,000 tires.

Already operating are Dunlop's new Madras factory, with a capacity of 134,000 tires, and the Cest Tire plant at Bombay, with a capacity of 300,000 tires. Premier Tire Co., at Alwaye, built with American technical aid, will start to produce at the rate of 240,000 tires annually late this year. The Goodyear Tire & Rubber Co. plant near Delhi, with a capacity of 213,000 tires, will go on stream this summer.

The other two factories licensed are still in the planning stage. General Tires, Ltd., sponsored by National Rubber Manufacturers, Ltd., of Calcutta, plans a West Bengal factory with a capacity of 180,000 tires. The plant and technical equipment will be supplied by Technoexport, Praha, Czechoslovakia. Another plant has been licensed for Madras, to be built by an Indian firm with United States technical and possibly financial assistance.

In addition, the Indian Government is considering licensing a second factory in Kerala.

At the same time the Indian Government is pushing plans to utilize the estimated 38 million cubic feet of gas available in Assem for polymers, rubber chemicals, and plastics, the *Indian Rubber Bulletin* revealed.

Phillips Petroleum International Corp., New York, in collaboration with Duncan Brothers, Calcutta, is reported ready to build facilities for producing 20,000 tons of *cis*-4 polybutadiene, 5,000 tons of channel black, and 4,000 tons of polyethylene a year from natural gas.

Kesarem Cotton Mills, Ltd., Calcutta, in collaboration with J. M. Huber Corp., plans manufacture of 5,000 tons of channel black, and Continental Carbon Co. plans to produce 10,000 tons of furnace black annually.

Davenport & Co., Ltd., Calcutta, plans creating a new company in collaboration with Witco Chemical Co., to produce 24,000 tons of SBR and 6,000 tons of polystyrene a year.

Plans reported earlier, for construction of tire cord facilities and reclaimed rubber facilities, tie in with the push for greater tire production in the next five years.

Last year India produced 674,555 motor vehicle tires, compared with 541,339 in 1959, a gain of 24.6%. Bicycle tires, still an important item in a country with a comparative shortage of cars, also rose. A total of 5,292,800 bicycle tires was produced, against 4,695,900 in 1959, an increase of 11%.

Rubber footwear production went from 19,530,000 pairs in the first half of 1959 to 22,860,000 in the first half of 1960, an increase of about 12%. Dipped goods rose from 12,290,000 dozen in 1959 to 15,570,000 dozen in 1960.

Malay Rubber Exchange

A rubber exchange corporation should be set up by the Malayan Federation, a study committee set up by the Malayan Government has recommended. The committee recommended:

The corporation should be open to all members of existing organizations connected with the rubber industry in the Federation and should provide contracts, discipline in the trade, arbitration, price fixing, and facilities for ordinary f.o.b. and physical transactions, similarly to the Singapore Chamber of Commerce.

Contract conditions and sales should be made enforceable by law.

Federation and Singapore markets should cooperate on arbitration, price fixing, standards, and invoicing, setting up a joint committee when necessary, with identical contracts in each market, enforceable in both Singapore and the Federation, and members of the Singapore market should be given associate membership in the Federation organization, and *vice versa*.

The Federation Government has appointed a nine-member committee, headed by Lew Sip Hon, controller of the Export Commodities Division of the Ministry of Commerce and Industry, to draft a constitution and rules for such a corporation, together with any government legislation necessary to supplement the corporation rules.

World Rubber Group?

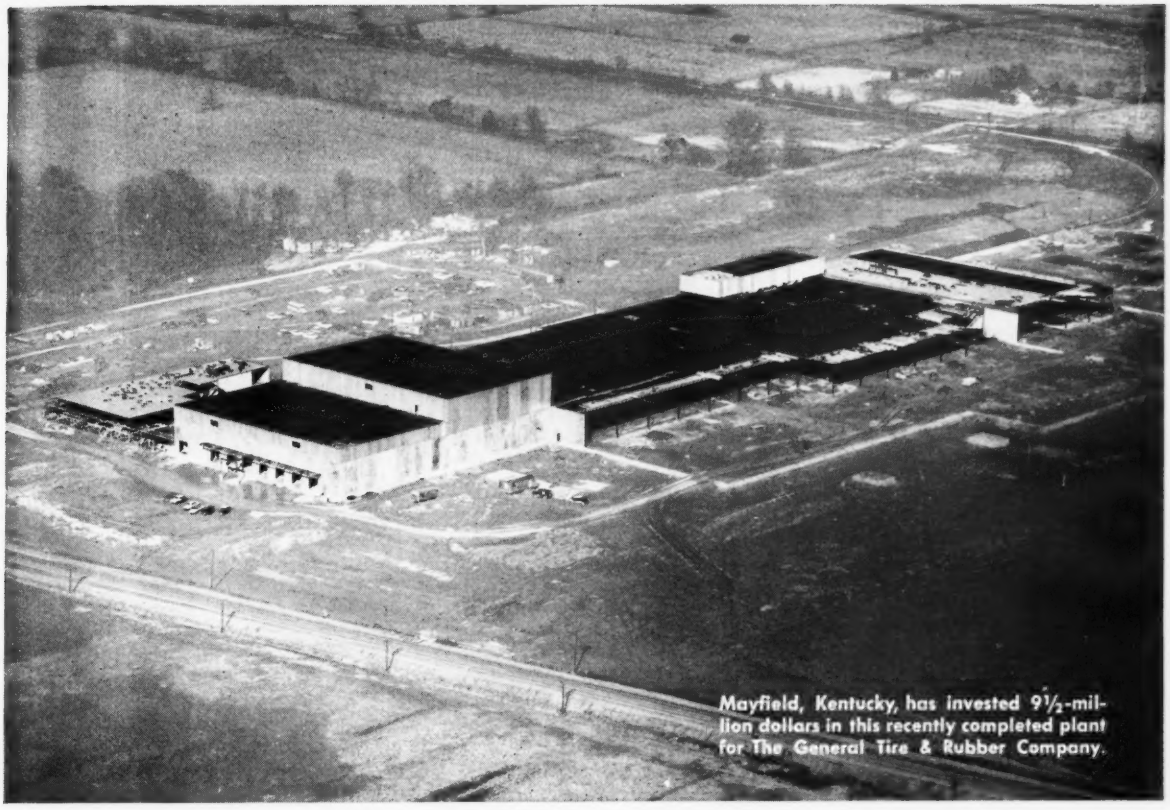
Formation of an international natural rubber association, suggested several times in recent months, was urged by Heah Joo Seang, president of the Penang Rubber Trade Association.

Heah suggested that the increasing use of synthetic rubber is due to prejudice against natural rubber because of wide price fluctuations, complaints on quality of shipments, and fears of inadequate supplies. He urged that an association be formed to take steps to prevent price fluctuations, to maintain uniform quality, and to solve the supply problem by stepping up the volume of natural rubber production, the last to be done by introducing replanting and new planting programs in every producing country.

The organization, which would include all Asian and African natural rubber producing countries, would pool all resources of science, technique, and information in order to solve the problems confronting the industry, he suggested.

He also suggested that the Malayan Government consider the advisability of establishing trade commissions or appointing commercial attaches in every embassy and consulate throughout the world where rubber is consumed in order to permit concerted action in the interests of the industry. In order to increase natural rubber consumption, he urged that the government build more rubber roads, and that it ask countries whose exports to Malaya exceed their imports of rubber to help Malaya by buying more natural rubber in preference to synthetic rubber.

Although stabilization of prices is supported in principle, many persons in



Mayfield, Kentucky, has invested 9½-million dollars in this recently completed plant for The General Tire & Rubber Company.

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E. B. Kennedy, *Commissioner,*
Kentucky Department of Economic Development,
650 Capitol Building, Frankfort, Kentucky

COMMONWEALTH OF
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WHERE BIG THINGS ARE HAPPENING

the field doubt the possibility of securing cooperation of a large number of producing countries in such a scheme. The fear also is that such a plan might tend to freeze prices at a high level, giving synthetic rubber a competitive edge.

New Replanting Plan

With Malaya's rubber replanting plan due to end in 1962, the Federation Government has appointed a committee including both government and rubber industry representatives to draw up a new replanting plan for estates and smallholders, together with recommendations for financing the plan.

The Rubber Producers Council of the Federation in its annual report issued a short time ago urged the government to start a new replanting plan in 1963 on lines similar to the present one.

"It seems clear," the report said, "that the next few years may well be the last chance for natural rubber growers to achieve reduction in costs before the impact of the stereo-regular rubbers is fully felt, and the necessity for more and continuing replanting to be carried out is therefore apparent. This is perhaps even more vital at the present time than when the government schemes for assistance were originally instituted in 1955."

Since 1955, estates have been receiving grants of $400 Straits an acre to replant up to 21% of their acreage, with $168 million Straits allocated to estates from the government's $280 million Straits replanting fund. No fresh applications for replanting aid for estates will be accepted after December 31, 1962, under the present plan. Smallholder aid is under no such limitation.

Japan Raises Output

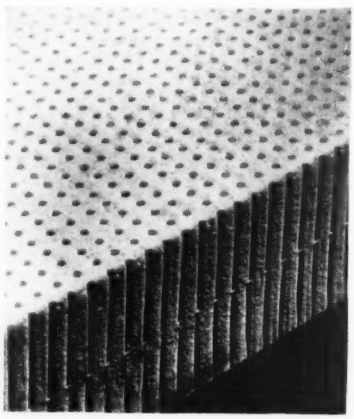
Japan expects to triple production of synthetic rubber in the next five years, from 58,000 metric tons in 1960 to 164,250 tons in 1965, the Japanese periodical, *Plastics Industry News*, reports.

Increases expected are: SBR, from 38,000 tons to 116,250 tons; high styrene rubber, from 6,500 tons to 11,500; chloroprene rubber, from 5,500 to 11,000; nitrile, from 3,000 to 5,000; butyl, from 2,500 to 10,500; and other rubbers, from 2,500 to 10,000 tons.

The partly state-owned Japan Synthetic Rubber Co. intends to increase present capacity of SBR from 30,000 metric tons to 45,000 tons and to add capacity for 5,000 metric tons of butyl rubber. By 1962 the company hopes to have capacity for 20,000 tons of isobutylene monomer and by 1965 capacity for 10,000 tons of 1,4 *cis*-polybutadiene.

In addition, at least five other companies have plans for synthetic rubber production. Japanese Geon Co. hopes to increase present capacity of 8,000 tons of high styrene rubber and latex, nitrile rubber, SBR, and lignin rubber to 30,000 tons; Showa Neoprene Co., jointly owned by Showa Denko and E. I. du Pont de Nemours & Co., Inc., will erect a plant to produce 8,000 metric tons of neoprene a year starting in 1962; and Kanegefuchi Chemical Co. is building a pilot plant for monthly output of 10 metric tons of chloroprene, using its own technique.

By the middle of this year Denki Kagaku Co. expects to produce 150 tons of chloroprene a month, and Toa Fuel Co., in collaboration with Esso Research & Engineering Co., expects to produce butyl rubber soon; while Bridgestone Tire Co. is building a pilot plant for producing a ton of 1,4 *cis*-polyisobutadiene daily.



Perforated foam sheeting by Rubatex

Dutch Firm Develops Light Foam Sheeting

N. V. Rubatex, Weesp, Netherlands, has begun manufacture of perforated foam rubber sheets for use in furniture upholstery and mattresses. Because of the small holes piercing the material, weight of the sheeting is reduced 20% without loss of strength or resiliency, Rubatex claims. Amount of foam needed also is down 20%.

Besides cutting weight and increasing air circulation, the perforations provide a rough surface which prevents covering material from shifting, Rubatex notes.

The sheeting is made by use of pin inserts used in a conveyorized continuous mold process. Sheeting can be produced in thicknesses varying from 0.24-inch to four inches, widths up to 6½ inches, and unlimited lengths, according to Rubatex. Sheets may be cut to any shape without having to finish seal the borders.

Because the material is reversible and because of its weight-supporting capacity, it is used in hospitals and other institutions.

Czech Polymer Plans

Czechoslovakia is directing research and plant expansion plans toward production of new types of synthetic rubbers in order to permit per capita consumption of six kilograms (13.2 pounds) of rubber, compared with the present four kilograms (8.8 pounds). *Soviet Rubber Technology's* May, 1960, issue reports. At present Czechoslovakia imports almost all its rubber.

Soviet Rubber Technology further reports that an economical process has been worked out for producing a high plasticity rubber in crumb form, using colophony as the emulsifying agent. Success is reported in research aimed at separation of synthetic emulsifying agents from waste materials from factory effluents, with the aim of reclaiming them.

A new type of selective calcium-nickel-phosphate catalyst has been produced for hydrogenating butane to butadiene, to be used when the second stage of construction of the synthetic rubber works at Kralupy is completed in 1965. The first stage of construction is to be completed in 1963.

Also to be completed in 1963 is a factory for making chloroprene rubber from acetylene obtained by partial oxidation of methane.

In the meantime Czechoslovakia continues large-scale imports of natural rubber. Under a recently signed agreement it will supply engineering parts to Burma in exchange for rubber and other products.

PELLETIZED NEWS

The Indonesian army has taken over 30 rubber and palm oil estates owned by Belgian nationals in North Sumatra. According to Lt. Col. Sunario, Indonesian army spokesman, the army had merely taken protective measures to prevent trouble and insure the safety of the plantations. The move was necessary "in view of existing chaos among the workers on the plantations," he said.

THE JOHORE LAND DEVELOPMENT BOARD will open up 19,000 acres of jungle land to 1,700 families under a plan to increase new planting of rubber by smallholders. Another plan is being considered to open up 4,800 acres in Johore Bahru district, and still another aims at planting 4,200 acres of rubber and 5,000 acres of oil palms. Several similar plans are already in operation.

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Recommended for use on such stock as tire carcass, inner tubes, footwear, molded heels or soles, sundries, sponge, automotive rubber, wire insulation, tubing, and all rubber goods exposed to the elements.

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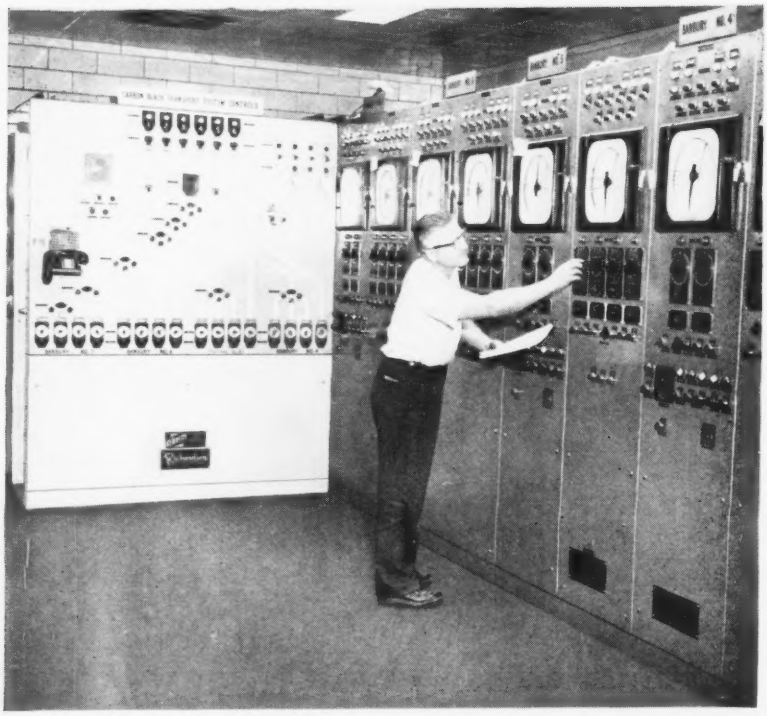

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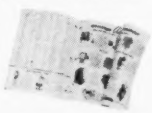

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news from abroad

CEYLON and CHINA have concluded talks for renewal of their rubber-rice trade agreement. Last year Ceylon bought 160,000 metric tons of rice in exchange for 17,000 metric tons of rubber. It is reported that China has agreed to pay 5 cents more than Singapore prices for every pound of rubber bought from Ceylon.

Construction has started on a Gates Rubber Co. hose and belting plant at Erembodegem, Belgium. The $4-million plant will produce automotive, industrial agricultural, light-duty, and variable-speed belting and wire-braided and molded hose for sale in the Common Market area.

SWITZERLAND imported 1,680,000 kilograms of rubber in February, against 1,805,000 kilograms in February, 1960. Natural rubber imports increased by 25,000 kilograms; while synthetic imports were 131,000 kilograms less than a year ago.

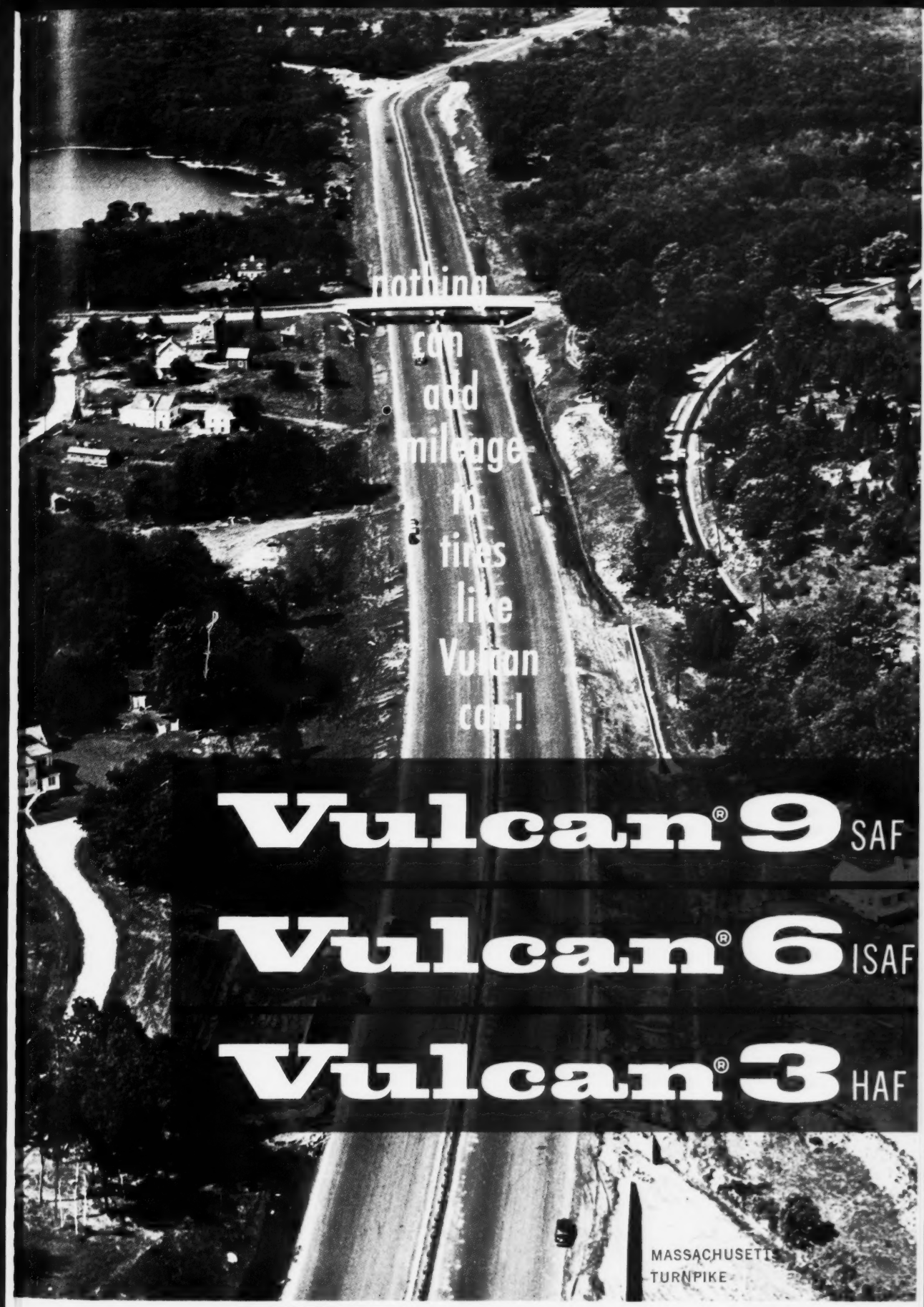
An unnamed American company is reported to plan joint operation with the Sakarya Rubber Industry Corp. of Sakarya's new tire plant at Arifye, Turkey. The plant will have an annual capacity of 250,000 tires.

VEREINIGTE GIANZSTOFF-FABRIKEN HG, Germany, AKU, Arnhem, Holland, and A. MANURER, SA, Berne, Switzerland, are collaborating to assist CENTURY RAYON CO., Bombay, India, in building a rayon tire-cord plant just outside of Bombay. Production is scheduled to start the end of next year.

Two more carbon black plants are in the works, one in Mexico and one in Indonesia. Negromex S.A., recently formed by a group of Mexican businessmen, will build a $4-million plant at Salamanca under license of Phillips Chemical Co., Akron, O. The plant, due onstream in 12 to 14 months, will have an annual capacity of 33 million pounds of blacks. Refining Associates, Los Angeles, Calif., will build a $4-million plant at Rantau, Indonesia, for P. T. Permina, a company owned by the Indonesian Government, in exchange for crude oil at market prices.

THE DOMINICAN REPUBLIC by 1965, when 102,000 trees will be in production, will be producing 1,020,000 pounds of rubber annually, the country's Secretary of Agriculture forecast. Another 89,000 trees are being planted in the San Francisco de Macoris and Miches areas, and the first of a series of rubber processing factories was opened last January at Majagual.

(Continued on page 128)



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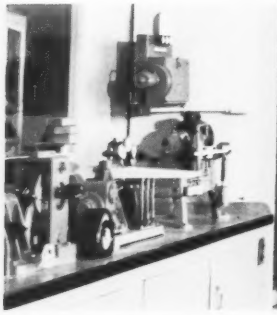
No matter what your requirements, or where in the world you are, Cabot can put more mileage in every single carbon black dollar you spend.



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Printed in U.S.A., May, 1

Ethylene-Propylene Rubber Could Have Bright Future—The Main Reason, Price

Synthetic Rubber

With current interest centered on polybutadiene, and to a lesser extent polyisoprene, there is little attention being paid to a copolymer which is still in the development stage—ethylene-propylene rubber.

Ethylene-propylene rubber may have the brightest future of any of the stereo rubbers. The main reason is price. If perfected, ethylene-propylene will be one of the cheapest, if not the cheapest, rubber on the market.

Montecatini, which is constructing a 20,000-ton-a-year plant to produce ethylene-propylene and ethylene-butylene rubbers, is reportedly planning to set a price of 18¢ a pound on ethylene-propylene. This compares with a present price of 23.5¢ for cold SBR and 15¢ to 17¢ for oil-extended SBR. An oil-extended ethylene-propylene rubber would be even cheaper, if feasible. In the stereo field Shell Chemical Co. is now marketing an oil-extended polyisoprene, and Phillips Chemical Co. is reported ready to produce oil-extended polybutadiene if the demand warrants.

Ethylene-propylene rubber is still some distance from being ready for the market, but on the basis of development work done in the United States to date, it is believed to have good aging qualities and abrasion resistance, and about the same heat buildup as SBR.

At present, Naugatuck Chemical Division of United States Rubber Co., AviSun Corp., and Hercules Powder Co. all have ethylene-propylene rubbers in the pilot-plant stage. E. I. du Pont de Nemours & Co., Inc., has a new ethylene-propylene in its laboratories, and other major producers are also carrying on research.

One of the main drawbacks of the polymer so far has been that the rubbers being tested require a peroxide curing system and are incompatible with natural rubber, SBR, and similar polymers. This is not an insurmountable obstacle, as witness butyl, but it does present difficulties which partly offset the low price of the polymer.

Du Pont, however, recently announced a new ethylene-propylene rubber which can be sulfur-cured by conventional techniques. According to the company, tests by its elastomers research laboratory indicate that the new elastomer processes well and can be compounded in a wide range of stable colors, in addition to being ozone, weather, and abrasion resistant.

The company says field evaluations are planned to verify laboratory findings. If laboratory tests are borne out, small quantities will be manufactured at a pilot plant near Beaumont, Tex. Samples will not be available until later in the year.

Du Pont estimates that full-scale commercial production of its polymer is two years away. By that time Naugatuck, now building a pilot plant to produce 300 tons of ethylene-propylene a year, may also be in commercial production, with Hercules, Avisun, and others in the race.

Meanwhile polybutadiene production is growing. Firestone Tire & Rubber Co. has started production at its Orange, Tex., plant, which has capacity of 30,000 tons a year, and Goodyear and Goodrich-Gulf will probably be on stream this fall. An estimated 165,000 tons of polybutadiene and polyisoprene capacity will be available in the United States by the end of this year, and 350,000 tons by 1965. For the fabricator, the choice of polymers is getting wider all the time.

Consumption of new rubber for February amounted to 108,927 long tons, compared with 121,307 long tons during January, according to the monthly report of The Rubber Manufacturers Association, Inc.

Consumption of all types of synthetic rubber during February totaled 77,047 long tons, contrasted with 86,158 long tons in January. Synthetic rubber accounted for 70.73% of total new rubber consumption, against 71.02% during January. Natural rubber consumption was 31,880 tons, compared with 35,149 long tons in January.

Consumption (in long tons) by type in February was: SBR, 63,970, against 71,653 in January; CR, 5,695 long tons, against 6,345 in January; IIR, 4,500, against 5,143; NBR, 2,400, against 2,591; stereo rubbers, 323 against 274; and other elastomers (unspecified), 159, against 152.

Production of synthetic rubber was 102,048 long tons, against 105,811 long tons in January. A total of 29,647 long tons was exported, compared with 26,045 tons in January.

Natural Rubber

Prices of natural rubber continued to rise slowly during the March 16-April 15 period although analysts continued to warn that the rise has little connection with the current supply-demand situation.

The steadiness of the rubber market appears to have been caused more by reluctance on the part of the sellers than by aggressive buying, and there seems to be no shortage despite temporarily lower production caused by wintering, analysts indicated. However, 12,116 lots were traded on the New York Commodity Exchange in March, compared with 7,480 lots in February, and 11,075 lots for the March 16-April 15 period, against 8,714 for the preceding period.

The price of near rubber was 30.85¢ and Rex Contract sales of 30.60¢ on Standard Contract sales at the end of the period, compared with 30.10¢ for near rubber on Rex Contract sales and 30.40¢ on Standard Contract sales at the end of the preceding period.

Spot rubber prices were 30.85¢ for RSS#1 at the end of the period, unchanged from the end of the preceding period. According to the Rubber Trade Association, however, the March average for RSS #1 was 30.20¢, against 28.99¢ for February, and the average for the March 16-April 15 period was 30.40¢, compared with 29.57¢ for the February 16-March 15 period.

The General Services Administration announced that 3,719 tons of stockpile rubber were sold during March. Pressure of stockpile rubber is expected to keep natural rubber prices around the cutoff price of 30¢ a pound until demand increases appreciably.

There are a fair number of indica-

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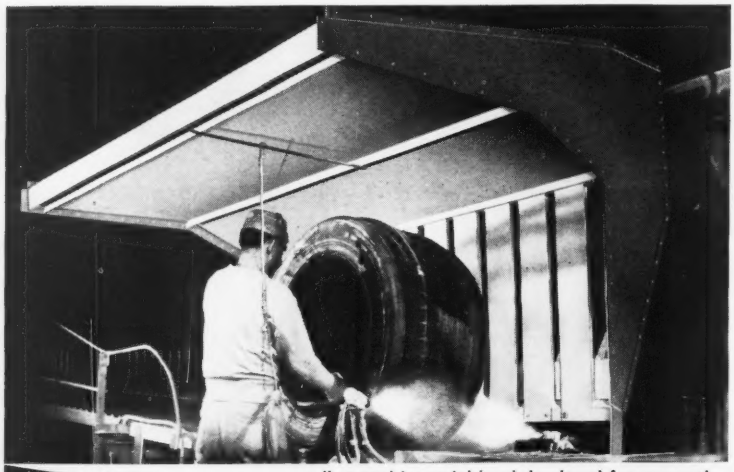
★ Results in higher working morale ★ Reduces maintenance costs



Illustrated is special hood developed for pneumatic pick-up of over-spray for the rubber industry.

Call an OBP engineer for a no obligation survey of your requirements. You may be surprised at the money you can save.

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CLEVELAND 12, OHIO

. . . leader in design, manufacture and installation of pneumatic handling and dust control systems

tions that increasing consumption of new rubber in the underdeveloped countries will not bring any pressure for higher natural rubber prices.

In India, for example, plans are to supplement the expected production of 45,000 tons of natural rubber by 1965 with increased production of synthetic rubber. As noted in the News from Abroad section, India has plans to produce large quantities of synthetic rubber from such sources as the refinery gases at Assam. In order to do this, capacity of 550,000 tons is planned to meet an expected consumption of 100,000 tons by 1965.

A generally lower level of prices in the future was indicated in a report of the United Planting Association of Malaya. The report noted, "The present sacrifice by producers in ploughing back a sizable amount of their profits into replanting will bear fruit in future years when natural rubber will have to compete with the stereo-regular synthetic rubbers."

Of the March sales on the New York Commodity Exchange, Rex Contract sales totaled 11,970, and Standard Contract sales, 146. For February the figures were 6,590 for Rex Contract sales and 890 for Standard Contract sales. There were 22 trading days in March and 21 in the March 16-April 15 period.

On the physical market, average March sellers' prices were RSS #3, 29.88¢; Amber Blankets, 24.93¢; and Flat Bark, 20.23¢.

REX CONTRACT

1961	Mar. 17	Mar. 24	Mar. 30	Apr. 7	Apr. 14
Mar.	30.60	29.63	——	——	——
May	30.60	30.10	30.05	30.05	30.85
July	30.15	29.98	29.90	29.95	31.00
Sept.	30.05	29.80	29.75	29.80	30.90
Nov.	29.90	29.71	29.65	29.70	30.75
1962					
Jan.	29.75	29.69	29.65	29.70	30.70

STANDARD CONTRACT

1961	Mar. 17	Mar. 24	Mar. 30	Apr. 7	Apr. 14
May	30.45	29.90	29.80	29.80	30.60
July	30.00	29.70	29.70	29.75	30.60
Sept.	29.90	29.60	29.55	29.60	30.45
Nov.	29.65	29.50	29.45	29.50	30.40
1962					
Jan.	29.65	29.50	29.40	29.50	30.35
Mar.	29.65	29.50	29.35	29.45	30.25
May	——	——	29.30	29.40	30.20

NEW YORK OUTSIDE MARKET

	Mar. 17	Mar. 24	Mar. 30	Apr. 7	Apr. 14
RSS #1	30.75	30.25	30.25	30.00	30.75
#2	30.50	30.13	30.13	29.85	30.63
#3	30.37	30.00	30.00	29.75	30.50
Pale Crepe					
#1 Thick	32.63	33.00	33.00	32.85	33.37
Thin	32.63	32.50	32.50	32.37	32.85
#3 Amber Blankets	25.25	25.00	25.00	25.25	25.75
Thin Brown Crepe	25.25	24.75	24.75	25.00	25.50
Standard Flat Bark	20.50	20.75	20.50	20.50	21.00

Latex

Demand for drum latex fell off somewhat during the March 16-April 15 period. Although there were limited exchanges, the sales were believed insufficient to keep pace even with the present low production of latex. The bulk latex market was quite dormant, with very little interest shown.

Malayan production in February amounted to only 6,378 tons, contrasted with 8,828 tons in January. This output was the lowest in many years, it was reported. Stocks at the end of February were 7,427 tons, against 8,326 tons on January 31.

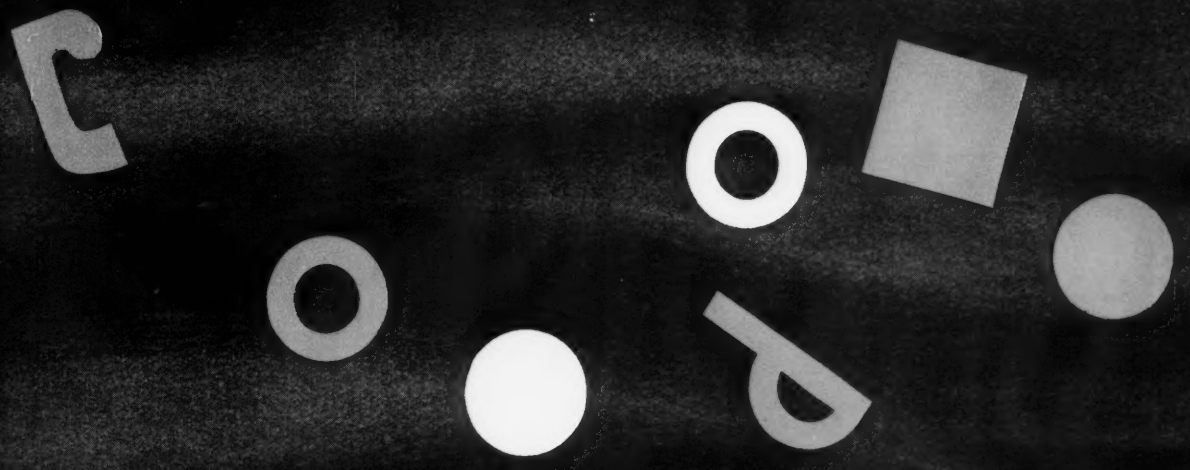
United States consumption of natural latex in February was 3,400 tons, compared with 3,525 tons in January. Consumption of synthetic latices, on the other hand, dropped more sharply, from 8,451 tons in January to 7,580 tons in February. Percentage of natural latex to total latices consumed was 30.97% in February, against 29.43% in January. This rise was attributed to falling prices of natural latex.

Prices for ASTM centrifuged natural latex, in tank-car quantities f.o.b. tank car, were 36.37¢ per pound solids on April 15, against 34.06¢ on March 15. Synthetic latices prices remained at 26

SILICONE NEWS from Dow Corning

SILASTIC LS
fluorosilicone rubber

is successfully solving design problems in sealing solvents, oils and fuels at temperatures from —100 to 350 F



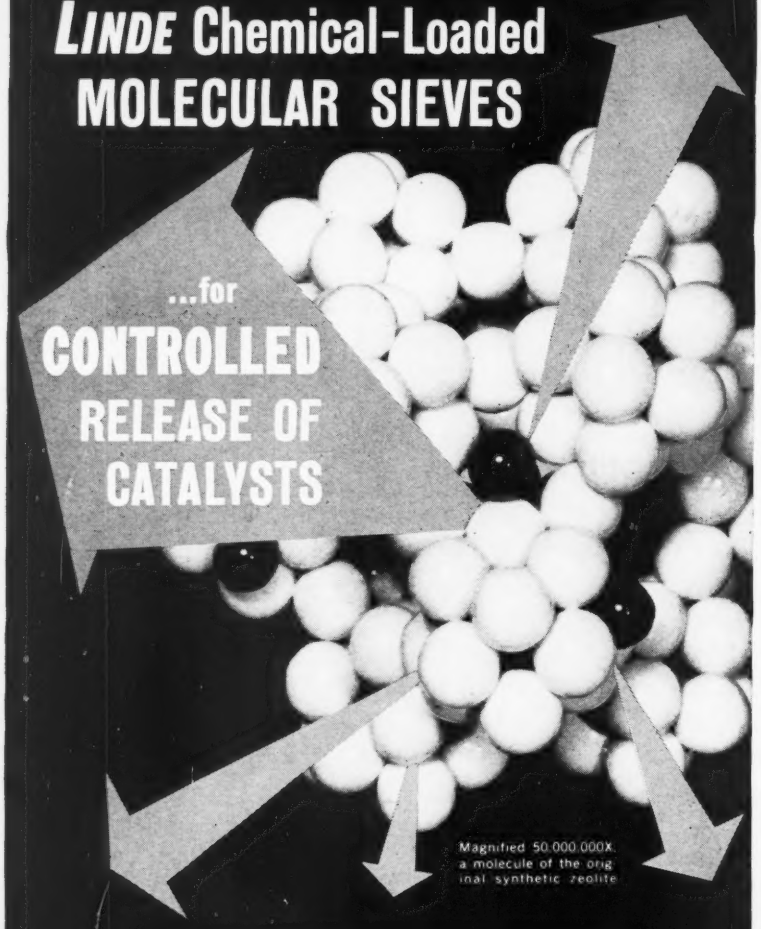
Send for brochure detailing the benefits of Silastic® LS, the Dow Corning fluorosilicone rubber . . Address Dept. 951

first in silicones

Dow Corning CORPORATION
MIDLAND, MICHIGAN

LINDE Chemical-Loaded MOLECULAR SIEVES

...for CONTROLLED RELEASE OF CATALYSTS



Magnified 50,000,000X, a molecule of the original synthetic zeolite

TODAY'S MOST EFFICIENT MEANS OF CONTROLLING VOLATILE COMPOUNDS

LINDE Chemical-Loaded Molecular Sieves are different from other curing catalysts. Their billions of tiny, uniform, high-capacity cavities can adsorb a wide range of highly active chemicals... **and retain them until they are needed!**

Materials are released into compounds by either heat or displacement . . . production time and costs can be significantly reduced.

For fast, safe rubber and plastics curing—and other industrial uses where control of catalysis availabilty is a "must"—LINDE Chemical-Loaded Molecular Sieves can meet exacting release requirements.

For details, write Dept. R-5 Linde Company, Division of Union Carbide Corporation, 270 Park Avenue, New York 17, New York. In Canada: Union Carbide Canada Limited, Linde Gases Division, 123 Eglinton Avenue East, Toronto 12, Ontario.

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Linde MOLECULAR SIEVES

UNION CARBIDE

"The Original Synthetic Zeolite" (Patented)

Special Notice

The usual listing of classified rubber chemicals and compounding ingredients with prices which would normally be included in this issue of RUBBER WORLD does not appear this month. It became apparent that over the passing of time with additions being made, price changes being entered, and the lack of knowledge when materials became obsolete, the list had developed some inaccuracies, ambiguities, or other errors. Rather than attack the list piecemeal or use outdated information, it was felt that a complete revision was in order.

The listing will, therefore, reappear in the July issue of RUBBER WORLD as a brand new, up-to-date compilation of existing rubber materials with the latest prices.

Any supplier who has any reason to believe that his materials and prices are not now on file in our office please contact us as soon as possible so that our list will be of maximum use to our readers.

We hope that this omission this month will not too greatly inconvenience anyone, but we feel that the greater service of the revised listing justifies taking the time to be as accurate as possible and is more in keeping with RUBBER WORLD's policy of maximum service to the rubber industry. EDITOR.

to 40.24¢ for SBR, 37 to 57¢ for CR, and 45 to 60¢ for NBR.

(All figures in long tons, dry weight)

Type of Latex	Production	Imports	Consumption	Month-End Stocks
Natural				
Dec.	0	3,572	3,588	9,225
Jan.	0	*	3,525	12,377
SBR				
Dec.	6,934	——	6,756	9,204
Jan.	7,821	——	6,667	9,395
Neoprene				
Dec.	660	——	750	1,665
Jan.	853	——	779	1,582
Nitrile				
Dec.	996	——	898	2,242
Jan.	1,174	——	1,005	2,128

* Not available yet for period covered.

Reclaimed Rubber

Auto sales are increasing with the coming of spring, and as a result, reclaimed rubber shipments were 20% higher during the March 16-April 15 period than for the 30-day period preceding, an Eastern reclaimer reported.

A Midwest reclaimer, on the other

How can we help you make better rubber-base adhesives?

Making any of the adhesives in this picture? Then you'll be interested in the property control you can get with Durez phenolic resins as ingredients of your adhesives.

For an example, take hardness (or softness) in a nitrile rubber solvent cement. You can vary this important film property to the exact degree you want, just by varying the rubber-to-resin ratio. It's that simple.

Doing so, you end up with a nitrile-base thermosetting cement that cures at room temperature to a strong, permanent bond. (For a *very* strong bond, it can be cured at 250°F, but this is seldom necessary.) The bond resists heat and grows stronger, not weaker, with age.

Let's suppose you want to make an adhesive for bonding nitrile rubber—cured or uncured—to metal. There's a Durez resin that greatly simplifies this job. It gives strong bonds to copper, brass, aluminum, tin plate, steel, stainless steel—and even gives medium-good adhesion to zinc plate and galvanized steel.

Formulating neoprene or natural-rubber cements? Nitrile or high-styrene-butadiene latex adhesives? Again, Durez resins give you the same sort of property control, plus certain specific advantages we'll be glad to tell you about.

We do not make adhesives, but we can put 40 years of resin experience to work for you.

DUREZ PLASTICS DIVISION

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IMPORTANT NEWS for
Conveyor Scale Users...

CompuDyne Corporation

announces the acquisition of

TRANS-WEIGH COMPANY

and

AUTOMATIC MEASUREMENTS CO.

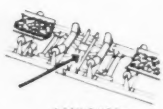
to broaden the facilities of
its subsidiary

Weighing & Controls, Inc.

Sales and manufacturing will be consolidated under Weighing & Controls, Inc. Trans-Weigh Co. and Automatic Measurements Co. have specialized in the development of electronic weighing systems. Weighing & Controls, Inc. have developed pneumatic weighing systems. The consolidation of these companies gives industry the most advanced engineering thinking and the highest production efficiency available, for automatic weighing control and data processing. Any system from the simplest to the most complex will benefit from this new, consolidated source.

Whether your problem is in Conveyor Scale, Batch Weighing, Constant Feed Weighing, or Check Weighing . . . in heavy or light industry . . . call W & C.

WC102


CONVEYOR SCALE SYSTEM

CONSTANT-FEED WEIGH-HOPPER SYSTEMS

CHECK WEIGHING SYSTEMS

CONTROL PANELS

W & C

Weighing & Controls, Inc.
Subsidiary of **CompuDyne Corporation**
Industrial Park, E. County Line Road, Hatboro 10, Pa.

hand, reported no appreciable pickup in business during the period. Chances are that business will not increase sizably until the year is farther advanced.

According to The Rubber Manufacturers Association, Inc., production of reclaimed rubber during February was 19,600 long tons, against 22,528 long tons in January. Exported were 1,090 long tons, compared with 1,084 long tons in January. Consumption of reclaim was 18,425 long tons, contrasted with 22,052 tons in January.

RECLAIMED RUBBER PRICES

Whole tire, first line	$0.115
Third line	.1075
Inner tube, black	.17
Red	.22
Butyl	.16
Light carcass	.22
Mechanical, light-colored, medium gravity	.185
Black, medium gravity	.11

The above list includes those items or classes only that determine the price basis of all derivative reclaim grades. Every manufacturer produces a variety of special reclaims, in each general group separately featuring characteristic properties of quality, workability, and specific gravity, at special prices.

Scrap Rubber

With the reclaim market slow, the scrap rubber business was dormant during the March 16-April 15 period. According to The Rubber Manufacturers Association, Inc., scrap rubber consumption for February was 18,132 long tons, down from 20,665 long tons in January. Prices remained unchanged.

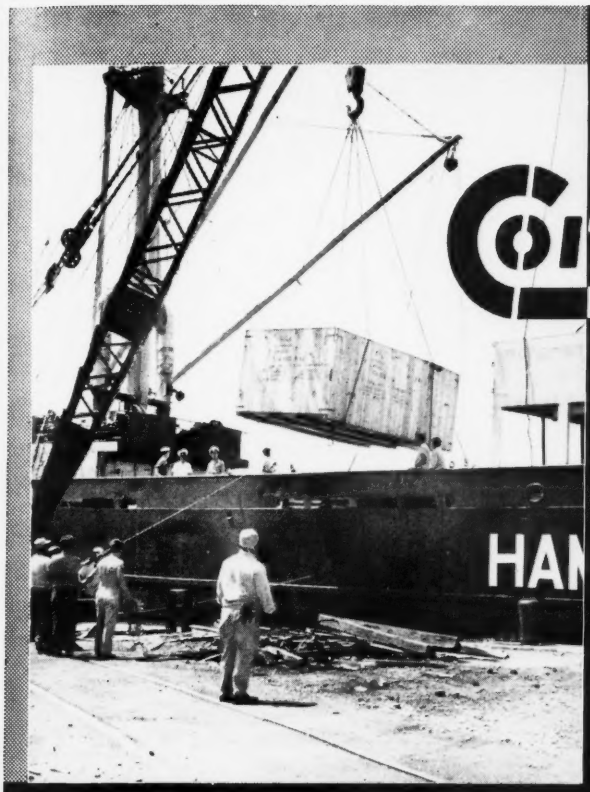
	Eastern Points Per Net Ton	Akron, O. Per Net Ton
Mixed auto tires	$7.00/$11.00	$11.00
S.A.G. truck tires	nom.	nom.
Peeling, No. 1	nom.	25.00
2	nom.	nom.
3	nom.	nom.
	(¢ per Lb.)	
Auto tubes, mixed	4.00	4.00
Black	5.75	5.75
Red	nom.	nom.
Butyl	5.75	5.75

Rayon and Nylon

Development of the two-ply passenger tire may solve one of the major problems faced by nylon tire-cord producers in their fight to have nylon-cord tires adopted as original equipment by U. S. auto manufacturers.

The problem, of course, is flat-spotting.

The two-ply tire, nylon producers feel, will minimize the flat-spotting problem in two ways. First, since two-ply tires will have less heat buildup than the present four plies, the tire cord will undergo less deformation under load of a parked car; therefore the



Computreater #40

The Litzler Computreater, in its few brief years of existence has so capably filled the vital need for a high-precision laboratory scale cord treater, that it has been welcomed by fiber producers and tire, conveyor- and V-belt manufacturers everywhere. The fortieth unit has now been completed and shipped. If you would like complete data on the unit that is now setting world standards for both cord and impregnation processing, write . . .

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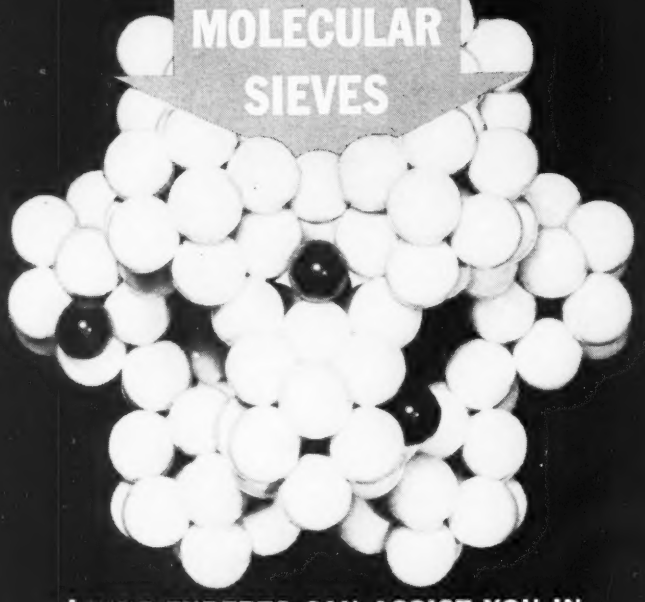
...with LINDE CHEMICAL-LOADED MOLECULAR SIEVES



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LINDE Molecular Sieves can adsorb or "load themselves" with several catalytic chemicals and effectively trap them for future controlled release.

Laboratory and engineering capabilities at LINDE now provide complete service on processes and systems using Chemical-Loaded Molecular Sieves. Technical Service is provided for all phases of an application—from inception to commercialization. In addition to ready availability for commercial processes, CLMS via custom-loading and self-loading are available for research, application development, pilot plant study, and semi-commercial production.

Whether your control problem involves catalysis, toxicity, corrosion, or volatility, LINDE Chemical-Loaded Molecular Sieves and technical service offer a proven solution.

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Linde MOLECULAR SIEVES

"The Original Synthetic Zeolite" (Patented)

UNION CARBIDE

depth of the flat spot will be less.

Second, and more important, the two-ply tire will be considerably more flexible than the four-ply and therefore will tend to absorb much of the shock of the flat-spot, cutting the amount of wheel deflection to a minimum, they argue.

Although two-ply rayon-cord tires would also ride smoother than four-ply, flat-spotting has never been more than minor in rayon-cord tires.

Several tire companies have produced rayon-cord two-ply tires for evaluation as original equipment on 1962-model compact cars. The likelihood is that two plies will be adopted as original equipment on standard cars for the 1963 or 1964 models. Whether they will be nylon or rayon two plies will depend on how strong a two-ply can be built using rayon or nylon, and how the prices stack up.

Packaged production of high-tenacity rayon yarn for March totaled 22.4 million pounds, compared with 19.8 million pounds in February. Domestic shipments were 20.5 million pounds, against 18.2 million pounds in February, and total shipments, including exports, 23.2 million pounds, compared with 20.4 million pounds in February. Stocks at the end of March were 17.3 million pounds, against 18.1 million pounds on February 28.

RAYON PRICES

Tire Fabrics

1100/490/2	$0.69
1650/908/2	$0.58/.615

Tire Yarns

High-Tenacity	
1100/ 490	.51
1100/ 980	.51
1150/ 490, 980	.51
1230/ 490	.51
1650/ 980	.57
1875/ 980	.57
2200/ 980	.57
Super-High Tenacity	
1650/ 720	.57

NYLON PRICES

Tire Yarns

840/140	.92
1680/280	.92

■

Pelletized News

(*Continued from page 118*)

Japanese synthetic rubber consumption in 1961 is expected to be 90,200 tons, compared with 67,000 tons last year, the Japanese Ministry of Trade announced. Synthetic consumption is expected to be 35% of total new rubber use.

A Pirelli plant with an initial annual capacity of 120,000 tires and tubes is also under construction in Turkey.

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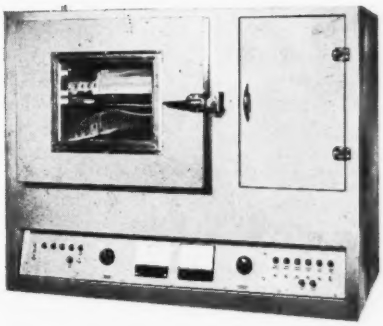
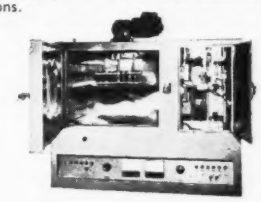
Phillips Chemical Co.
Texas U.S. Chemical Co.
TLARGI, U.S.C.
U. S. Rubber Company
Shell Chemical Corporation



Orec 0300 Series employ an *electronic-chemical loop feed back servo system to achieve and precisely maintain chamber ozone concentrations.



Orec 0300 with Dynamic Stretching Apparatus.
* *patent pending*

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- RECORDING INSTRUMENTATION
- STRETCHING APPARATUS
- MEASUREMENT INSTRUMENTATION
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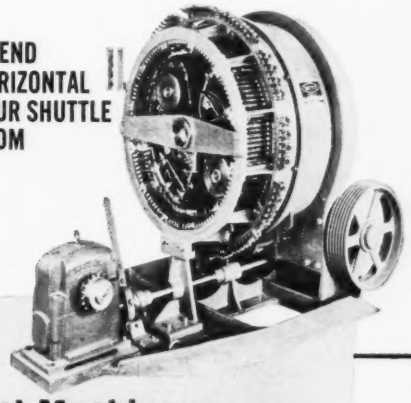
Phone Morris 3-4428 DEVINE, TEXAS P. O. Box 353

A. J. (AL) Morrow, Pres. & Gen. Mgr.

96 END HORIZONTAL FOUR SHUTTLE LOOM



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Basic White Lead Silicate	Sublimed Litharge
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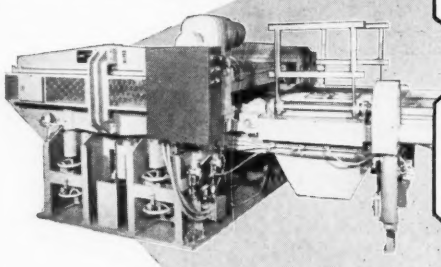

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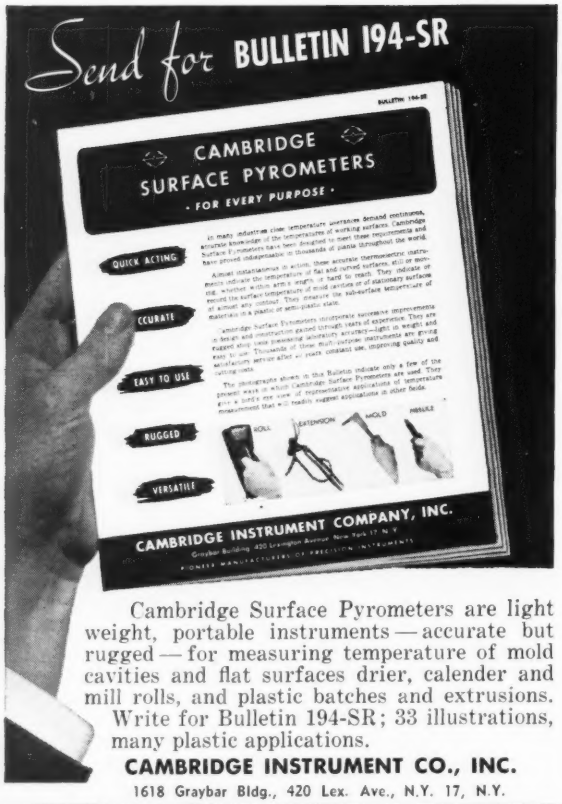
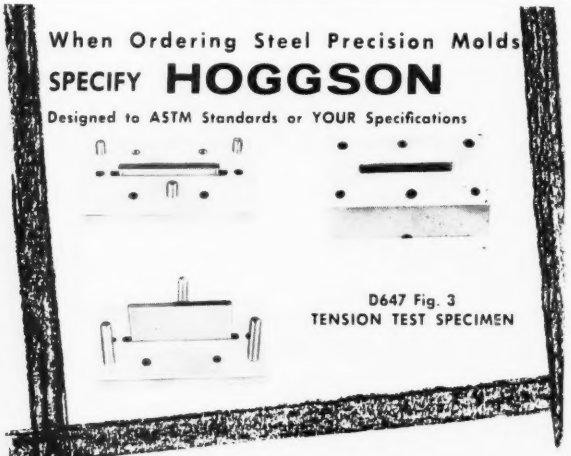


Cambridge Surface Pyrometers are light weight, portable instruments — accurate but rugged — for measuring temperature of mold cavities and flat surfaces drier, calender and mill rolls, and plastic batches and extrusions. Write for Bulletin 194-SR; 33 illustrations, many plastic applications.

CAMBRIDGE INSTRUMENT CO., INC.
1618 Graybar Bldg., 420 Lex. Ave., N.Y. 17, N.Y.

THEY HELP SAVE MONEY AND MAKE BETTER PLASTICS

When Ordering Steel Precision Molds
SPECIFY **HOGGSON**
Designed to ASTM Standards or YOUR Specifications



D647 Fig. 3
TENSION TEST SPECIMEN

ANOTHER HOGGSON MOLD

Designed for a Specific Need

The D647, Fig. 3 Tension Test Specimen was designed to answer a specific problem. Hoggson engineers are known throughout the world for reputable service in supplying manufacturers of rubber, plastic and synthetic products with precision molds and dies for test samples or actual production. Send your requirements for Hoggson's suggestions. Ask for literature.

HOGGSON & PETTIS MFG. CO.
1415 Brewery St., New Haven 7, Conn.
Pac. Coast: H. M. Royal, Inc., Downey, Calif.

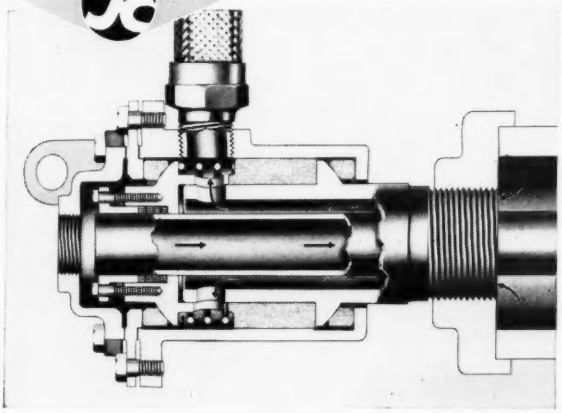
STANDS ALONE!

Type SN Johnson ROTARY PRESSURE Joint

There's not another rotary joint like the Johnson Type SN. Used where inlet or outlet pipe must rotate with the roll—on certain paper machines, drilled rolls of rubber or plastic mills and calenders, double shell dryers, and the like. Needs no external supports of any kind. Like all Johnson Joints the Type SN seals without packing, needs no lubrication or adjustment.

Investigate Johnson Joints for all steam-heated or water-cooled rolls. Handle Dowtherm, Monsanto Aroclors, hot oils too. Sizes to 8". For data on Type SN write for Bulletin N-2002.

THE JOHNSON CORPORATION
869 Wood St., Three Rivers, Michigan



Use CLAREMONT *Cotton* FLOCKS

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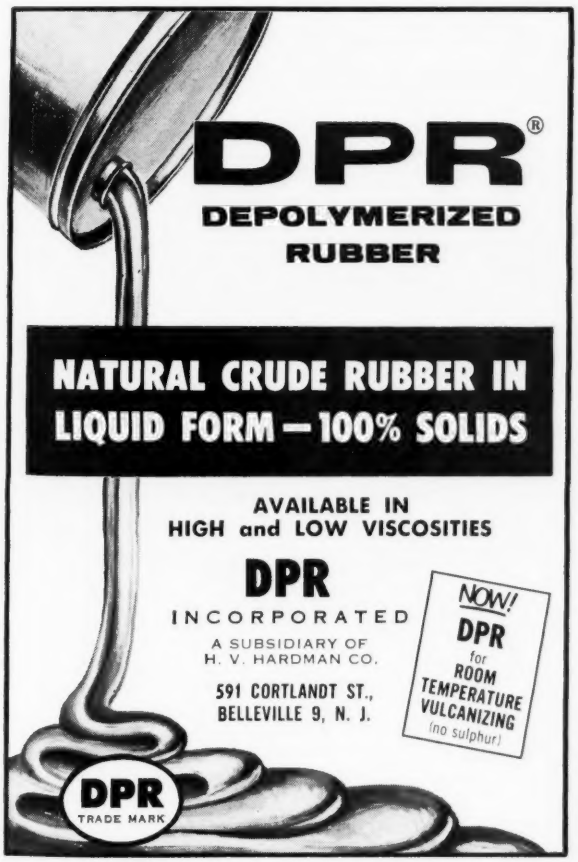

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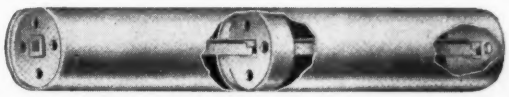

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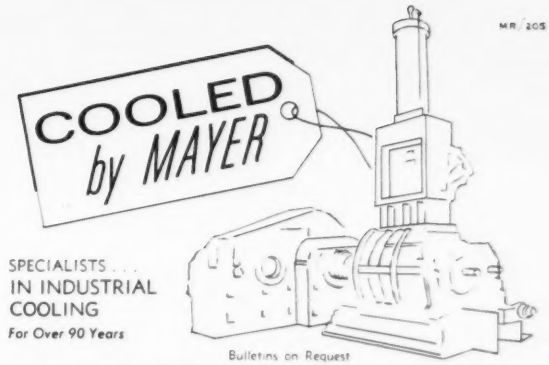

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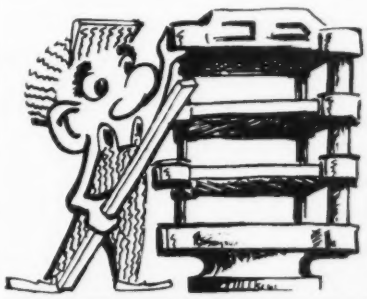

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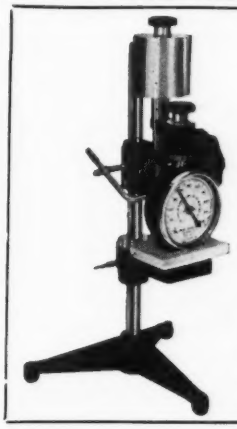

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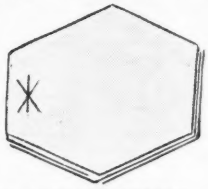

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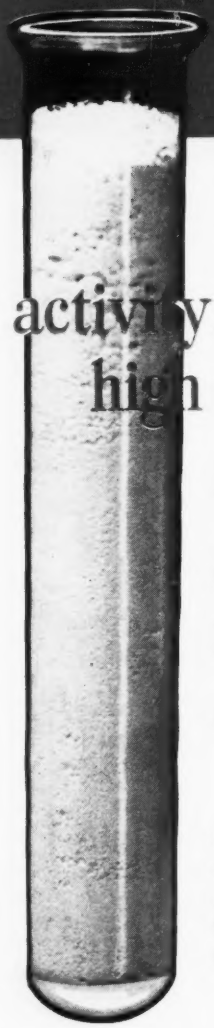

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